D101.60/4: 483

Technical Report 483

ABSTRACTS OF ARI RESEARCH PUBLICATIONS FY 1979

COMPLETED

ORIGINAL

U. S. Army

Research Institute for the Behavioral and Social Sciences

November 1980

Approved for public release; distribution unlimited.

128

U. S. ARMY RESEARCH INSTITUTE
FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency under the Jurisdiction of the
Deputy Chief of Staff for Personnel

JOSEPH ZEIDNER
Technical Director

L. NEALE COSBY
Colonel, IN
Commander

NOTICES

DISTRIBUTION: Primary distribution of this report has been made by ARI. Please address correspondence concerning distribution of reports to: U.S. Army Research Institute for the Behavioral and Social Sciences, ATTN: PERI-TST, 5001 Eisenhower Avenue, Alexandria, Virginia 22333.

FINAL DISPOSITION: This report may be destroyed when it is no longer needed. Please do not return it to the U.S. Army Research Institute for the Behavioral and Social Sciences.

NOTE: The findings in this report are not to be construed as an official Department of the Army position, unless so designated by other authorized documents.

A

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS
BEFORE COMPLETING FORM

1. REPORT NUMBER
Technical Report 483

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)
ABSTRACTS OF ARI RESEARCH PUBLICATIONS, FY 1979

5. TYPE OF REPORT & PERIOD COVERED
--

6. PERFORMING ORG. REPORT NUMBER
--

7. AUTHOR(s)
Army Research Institute for the Behavioral and Social Sciences

8. CONTRACT OR GRANT NUMBER(s)
--

9. PERFORMING ORGANIZATION NAME AND ADDRESS
U.S. Army Research Institute for the Behavioral
and Social Sciences (PERI-TS)
5001 Eisenhower Avenue, Alexandria, VA 22333

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
2Q161102B74F
2Q162717A764/765
2Q162722A766/779/777 (Cont.)

11. CONTROLLING OFFICE NAME AND ADDRESS
Office, Deputy Chief of Staff for Personnel
Washington, DC 20310

12. REPORT DATE
November 1980

13. NUMBER OF PAGES
107

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)
--

15. SECURITY CLASS. (of this report)
Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE --

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

--

18. SUPPLEMENTARY NOTES

--

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Psychological research	Military selection
Behavioral science	Organizational effectiveness
Individual and unit training	Performance evaluation
Training simulation	Manpower and personnel systems
Information systems	Systems effectiveness

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Abstracts and bibliographic citations, including the DDC accession number, are given for 159 Research Reports, Technical Papers, Technical Reports, and Research Notes released by the Army Research Institute (ARI) during Fiscal Year 1979. To complete the record of research accomplished by ARI in FY 79, abstracts or descriptions are included of 4 research products (e.g., TEC Media Alternatives: Procedure Guide for Delivery Systems Selection) and of 39 intra-agency Research Problem Reviews, Research Memorandums, and Technical Reports.

(Continued)

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Item 10 (Continued)

2Q162725A778; 2Q163731A768/770/781; 2Q163743A771/772/773/774/775/780/783.

Item 20 (Continued)

All items are indexed by author and corporate author and by research area. The Federal depository libraries where the published reports may be obtained are also listed.

Technical Report 483

ABSTRACTS OF ARI RESEARCH PUBLICATIONS FY 1979

U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES
5001 Eisenhower Avenue, Alexandria, Virginia 22333

Office, Deputy Chief of Staff for Personnel
Department of the Army

November 1980

Abstracts

Approved for public release; distribution unlimited.

ARI Research Reports and Technical Reports are intended for sponsors of R&D tasks and for other research and military agencies. Any findings ready for implementation at the time of publication are presented in the last part of the Brief. Upon completion of a major phase of the task, formal recommendations for official action normally are conveyed to appropriate military agencies by briefing or Disposition Form.

FOREWORD

The Army Research Institute for the Behavioral and Social Sciences (ARI) publishes a series of abstracts that summarize the research on which final or interim reports have been published during each fiscal year. The series began in 1957. This Technical Report contains the abstracts for research publications for FY 1979, October 1978 through September 1979.

During this period, ARI was the Army's developing agency for behavioral and social science and a field operating agency under the Office of the Deputy Chief of Staff for Personnel. Two laboratories and 10 operational field units provided a flexible research program on individual personnel utilization, training and evaluation, and leadership and management; and on simulation systems, manpower and educational systems, human factors in systems integration. The field units particularly emphasized providing responsive solutions to operational problems.

Joseph Zeidner

JOSEPH ZEIDNER
Technical Director

Blank Page

ABSTRACTS OF ARI RESEARCH PUBLICATIONS, FY 1979

CONTENTS

Page

INTRODUCTION 1

  Publication Categories 1
  Distribution of ARI Publications 2

ABSTRACTS OF RESEARCH PUBLICATIONS 3

  Research Reports 3
  Technical Papers 14
  Technical Reports 35
  Research Problem Reviews 46
  Research Memorandums 54
  Technical Reports (A Series) 62
  Technical Reports (B Series) 78
  Technical Reports (TH Series) 82
  Technical Reports (P Series) 84
  Research Notes 86

INDEX 95

DEPOSITORY LIBRARIES 101

DISTRIBUTION 115

ABSTRACTS OF ARI RESEARCH PUBLICATIONS, FY 1979

INTRODUCTION

The present volume of abstracts, continuing the series begun in 1957, summarizes the research publications of the Army Research Institute for the Behavioral and Social Sciences (ARI) for fiscal year 1979. Each volume of the series provides a synopsis of research efforts which reached publication stage during the period covered. The abstracts have been written, as far as possible, to describe the principal research findings in nontechnical terms; technical language is used to communicate efficiently the details of research analysis. Indexing by author and research area provides access to individual reports and topics.

Publication Categories

ARI Research publications are divided into separate, consecutively numbered categories appropriate to their intended audience and function. In FY 1979 the following categories were represented:

Research Reports. Operationally oriented, they describe completed research programs or projects which contribute directly to the solution of Army human factors problems in the broad areas of personnel management and enhancement of human performance, both of the individual and in the Army's manned systems.

Technical Papers and Technical Reports. Research oriented, they present technical information on research methodology or basic psychological knowledge developed out of the ARI work program. They are primarily of interest to technically trained research workers in the Defense Department and other government agencies. The designation of the series was changed from Technical Paper to Technical Report, beginning at Technical Report 386; the numbers continue in sequence.

Research Problem Reviews. These are informal reports to military management, generally in response to questions raised by operating agencies requiring early answers. They may include presentations to military management, interim bases for changes in personnel operations, and bases for research decisions. The category was discontinued in FY 79.

Research Memorandums. These are informal intra-agency reports on technical research problems. They may present details on the construction of experimental instruments, fragmentary or incidental data, or methodological developments related to in-house technical questions. The category was discontinued in FY 79.

Special Publications (P series). These are not reports about research but valuable results of research. Examples are the guidebooks for developing skill qualification tests or videotape simulation performance tests. The category was discontinued in FY 79.

Technical Reports. Prepared by a contractor or grantee on contract research developed and technically monitored by ARI, and approved by ARI as meeting professional standards, they are usually operationally oriented. Distribution depends on the nature of the report--it may be that of a Research Report (A series) or a Research Problem Review (B series), or it may be oriented to scientists performing basic research (TH series). The entire category was discontinued in FY 79 and the term "Technical Report" applied to the research-oriented category previously known as Technical Papers.

Research Notes. Prepared by a contractor or grantee on contract research developed and monitored by ARI, they may be either operationally or research oriented.

Distribution of ARI Publications

Initial distribution of these reports was made directly by ARI. Research Reports and Technical Reports of the A series were distributed primarily to operational and research facilities and their sponsors in the Defense Department, to other interested Government agencies, and to the Defense Technical Information Center (DTIC). Research Reports were also sent to the Library of Congress, which sends documents to Federal depository libraries. Technical Papers and Technical Reports in the TH series were distributed primarily to technically trained research workers, including those reached through DTIC and, for Technical Papers, the Library of Congress. Research Problem Reviews, Research Memorandums, and Technical Reports of the B series, as operating or intra-agency documents, seldom received general distribution; they are summarized here to provide a fuller record of ARI research. File copies may be maintained at ARI offices in Alexandria, Va., and record copies of many have been deposited in DTIC in accordance with the DTIC mission as an information center. Research Notes were deposited in DTIC. They are available only from DTIC or its coordinating agency, the National Technical Information Service (NTIS), in hardcopy or microfiche.

Qualified requesters may obtain copies of reports deposited in the Defense Technical Information Center directly from DTIC, Cameron Station, Alexandria, Va., 22314. Anyone may purchase documents from NTIS, Department of Commerce, Springfield, Va., 22151. The multidigit AD number given for each report is the accession number that should be used in requesting documents from DTIC or NTIS.

Research Reports and Technical Papers may also be obtained on loan from depository libraries in many metropolitan and university centers. A list of these libraries is given at the end of this publication.

Research Reports

RR 1203. Meliza, L. L., Scott, T. D., & Epstein, K. I. *__REALTRAIN validation for rifle squads II: Tactical performance__. March 1979. (AD A069 957)*

A field experiment was conducted to assess the relative effectiveness of REALTRAIN (an engagement simulation training system) and conventional field training for infantry rifle squads. Eighteen rifle squads were given (a) a tactical pretraining test, (b) 3 days of training--nine using REALTRAIN and nine using conventional methods, (c) a posttraining test, and (d) a series of tactical exercises in which REALTRAIN and conventional squads opposed one another.

Data collected on the behavior of squads during engagements were shown to be related to end-product measures of tactical performance. Data on tactical performance, mission accomplishment, and casualty exchanges indicated that REALTRAIN-trained squads showed large improvements, whereas conventionally trained squads showed little improvement over pretraining test performances. The testing thus showed that in the training of rifle squads, REALTRAIN is more effective than conventional field training.

RR 1204. Scott, T. D., Meliza, L. L., Hardy, G. D., Jr., Banks, J. H. (ARI); & Word, L. E. (U.S. Army). *__REALTRAIN validation for armor/anti-armor teams__. March 1979. (AD A069 944)*

A field experiment was carried out to determine the relative effectiveness for armor and anti-armor training of the engagement simulation system REALTRAIN and conventional training that did not employ engagement simulation. Eight armor/anti-armor units were given a pretraining tactical test, 5 days of tactical training using either REALTRAIN or conventional methods, and a posttraining test. Finally, the REALTRAIN and conventional units opposed one another in a series of "shoot-off" exercises.

Results were assessed for both attack and defense in terms of mission accomplishment, casualties inflicted and sustained, and detections by the tested units and their opposing forces (10 measures).

All units performed at similar levels in pretraining tests. In posttraining tests, REALTRAIN units improved on an average of about eight measures; conventionally trained units, on about four measures. REALTRAIN units won six of seven shoot-off engagements and sustained fewer and inflicted more casualties than did conventionally trained units.

RR 1205. Shields, J. L. (ARI); & Joyce, R. P., & VanWert, J. R. (Applied Science Associates). *__Chaparral skill retention__. March 1979. (AD A069 945)*

How well soldiers learned and retained selected Chaparral missile skills was evaluated as a function of Advanced Individual Training (AIT), refresher training, and time.

Six Chaparral tasks included in the Soldier's Manual were selected for evaluation. Hands-on performance tests were developed and validated. All tasks were performed using the appropriate Technical Manual.

The research design divided 99 soldiers into three experimental groups. In all groups, soldiers were tested immediately after they completed AIT, tested and trained to standard when they arrived in one of seven Chaparral battalions, and retested 4 months after arrival and training in the unit. In addition, one group of soldiers was retested and trained 1 month after their first test and another group 2 months after their first test. The third group was given no additional testing or refresher training.

Results suggested that performance testing and enforced use of job aids appear to be promising ways to maintain task proficiency. Although performance declined over the time intervals in the research, the procedures used in this research forced the individual to use the appropriate Technical Manual to perform the test task. The job aid facilitated skill retention and reduced the need for refresher training. The findings were basically the same for all tasks.

RR 1206. Finley, D. L., & Strasel, H. C. *__BT33 training effectiveness analysis__. April 1979. (AD A069 184)*

The BT33 is a Swedish-built Forward Observer (FO) trainer for institutional use. This training effectiveness analysis of the BT33 investigated the cost and training benefits of the FO training device in support of a program to develop a unit FO training device for the U.S. Army.

The procedure compared data on FO performance resulting from the current FO training course (which uses costly live-fire exercises) to data on FO performances resulting from seven variations of the course using the BT33.

Questionnaire data obtained from students, instructors, and BT33 operators provided qualitative information on good and poor aspects of the BT33 and its acceptability for training and evaluation.

The results determined that the FO training device concept is valid. Training in the BT33 programs appeared overall to be as good as or better than the current training program.

RR 1207. Yates, L. G. *__Status of unit training within USAREUR units__. April 1979. (AD A072 627)*

A questionnaire and interview survey during summer 1976 gathered information on training conditions from experienced company/battery commanders, battalion commanders, and S3s in 15 USAREUR infantry, armor, and field artillery battalions. Conditions investigated were company/battery activities; training activity priorities, handicaps and constraints, resources, requirements, and methods and standards; and the commander's role in training and commander preparedness.

Although more time was reported spent in combat-related company/battery training activities (75%) than commanders theoretically recommended (66%), commanders rated the amount of time available for combat-related training as adequate to borderline. Training priorities varied widely. Many training handicaps were reported: command emphasis on nontraining programs; lack of personnel and crosstraining; constraints of limited training time, area, facilities, and funds; changing priorities; and nontraining missions. Training facilities seemed adequate. Two-thirds of the training materials listed had been used and materials were rated adequate. Adequacy of training time was rated borderline. The actual and idealized training roles corresponded well for company/battery commanders, but not so well for battalion commanders. Commanders felt well prepared to use available weapons systems but expressed a need for more maneuver and field training with support systems and other branches, and for better unit training in maintenance of weapons systems.

RR 1208. Holmgren, J. E., & Hilligoss, R. E. (ARI); & Swezey, R. W., & Eakins, R. C. (Litton Mellonics). Training effectiveness and retention of training extension course (TEC) instruction in the combat arms. April 1979. (AD A069 942)

The Army's Training Extension Course (TEC) Program consists of a large number of performance-oriented, self-paced lessons (mainly audiovisual) designed to provide individual instruction for enlisted men in Army units. This report describes the training effectiveness and retention of TEC instruction relative to conventional instruction.

TEC lessons were evaluated in five subject areas, one of which was common to all combat arms soldiers and one of which was specific to each of the four combat arms. Parallel experiments were conducted in the Active Component (AC) and the National Guard (NG). A total of 635 enlisted men were obtained from 12 AC battalions. The NG provided 539 men from 13 battalions. The sample for each subject area was divided into five experimental groups: (a) Group TL--TEC instruction with Lesson Administrative Instructions (LAI) pretesting and posttesting; (b) Group TO--TEC instruction only, without pretesting or posttesting; (c) Group CL--conventional instruction with LAI pretesting and posttesting; (d) Group CO--conventional instruction only, without pretesting or posttesting; and (e) Group BL--baseline group, with no instruction and no pretesting or posttesting.

On the day after instruction, all soldiers were given a hands-on performance test covering the subject area in which instruction was given. Eight to 9 weeks after instruction, the hands-on test was readministered to AC, and 7 to 12 weeks after instruction to NG units.

Averaged across the five subject areas, the TEC-trained soldiers performed better than the conventionally trained soldiers on both tests. Soldiers given pretesting and posttesting performed slightly better, on the average, than those receiving instruction without the testing. The baseline group performed at lowest level in all subject areas. The four groups receiving instruction forgot about the same average amount between the initial and the retention tests.

RR 1209. Holman, G. L. *Training effectiveness of the CH-47 flight simulator. May 1979. (AD A072 317)*

The training effectiveness of the CH-47 helicopter flight simulator was evaluated in two parts. Part I employed a classical two-group transfer-of-training design using 24 aviators undergoing transition training to the CH-47 helicopter, and Part II assessed the training benefits of periodic training of 16 operational CH-47 aviators in the CH-47 flight simulator using a pretest-train-posttest design. Cumulative transfer effectiveness ratios and learning curves are presented for 24 maneuvers taught in the simulator and the aircraft.

It was concluded that the CH-47 flight simulator is an effective training device for all maneuvers tested except those, such as hovering maneuvers, that require extensive visual ground referencing at very low altitudes. The simulator was also found to be inadequate for training night operations and terrain flights.

RR 1211. Hagman, J. D. *Typewriting: Retention and relearning. June 1979. (AD A072 369)*

Retention and relearning of straight-copy typewriting skill among 38 administrative specialists (71L Military Occupational Specialty) were examined after the no-practice retention interval between Advanced Individual Training (AIT) graduation and unit duty. The soldiers were tested at the end of the course before graduation from AIT, before the start of unit duty, and after the second test session and 25 minutes of practice typing.

Without practice, average typing speed dropped 12% and errors increased 86% between AIT graduation and unit duty--net typing proficiency fell below the minimum AIT graduation standard. However, 25 minutes of practice reinstated 28% of lost typing speed and 19% of lost net typing proficiency. Errors were not affected significantly by practice. Based on relearning rate, it was predicted that approximately 1½ hours of practice would be necessary to return net typing performance to minimum AIT graduation standards. After 2½ hours of typing practice, the end-of-course performance level would be regained. The conclusion was that brief refresher training was sufficient for administrative specialists to regain straight-copy typewriting skill.

RR 1212. Bauer, R. W., & Bleda, P. R. *Night armor training in simulated darkness. July 1979. (AD A073 729)*

To reduce problems with safety, logistics, and evaluative feedback inherent in training at night, ARI developed experimental light-attenuating devices (LADs), which simulate visual conditions of night during the day. Single-density or bidensity lenses can be fitted to various existing facemasks and used to conduct certain simulated night-training operations during the day, with little reduction in effectiveness.

Two concurrent field experiments applied LADs to supplement or supplant night armor training (a) in nighttime M60A1 tank driving--cross-country and obstacle course--by 462 M60A1 tank driver trainees, and (b) in classroom disassembly-assembly of the M219 machinegun by 430 tank turret trainees under simulated night conditions before testing under actual night conditions. Three groups were trained in each experiment: one group used LADs, one practiced under actual night conditions, and one received no comparable night training.

The LADs-trained groups performed as well as or better than the night-trained groups and significantly better than the daylight-trained groups. The LAD concept appears effective as a supplement or substitute for regular night training in selected situations. However, the actual equipment--welder's goggles and filter lenses--should be more rugged to withstand regular troop use.

RR 1213. Scott, T. D., Banks, J. H., Hardy, G. D., Jr., & Sulzen, R. H. REALTRAIN validation for rifle squads III: Tactical performance during movement-to-contact. July 1979. (AD A075 423)

A field experiment was carried out to determine the relative effectiveness of REALTRAIN, an engagement simulation training system, and conventional training. Eighteen rifle squads were given a tactical pretraining test, 3 days of training (nine squads using REALTRAIN and nine squads using conventional methods), a posttraining test, and a series of tactical exercises in which REALTRAIN and conventional squads opposed one another.

Performance during the movement-to-contact was shown to be highly correlated with subsequent performance during the attack. Consistent with earlier findings on tactical performance during contact and on mission accomplishment and casualty exchange, REALTRAIN was shown to be significantly more effective than conventional methods in the training of infantry rifle squads.

RR 1215. Schendel, J. D. Guidelines for effective selective listening. May 1979. (AD A072 314)

This report summarizes a literature survey designed to identify the problems involved in selective listening--an intelligence-gathering technique--and to recommend procedures for handling these problems. The research concentrated on the technique of overhearing the conversations of others. The problems considered include moving within earshot of these conversations, picking up and storing their information, and recounting their contents. Some of the procedures used to overcome these problems are described below.

The accessibility to target conversations can be improved by the listener's engaging in simple, well-practiced cover activities that do not require active verbal participation; by the listener's reducing the need to speak by working with a confederate, engaging in group conversations, using short phrases that entail extensive replies, or choosing fellow conversants likely to do more speaking than listening.

Monitoring target conversations can be enhanced through training, by maintaining some visual contact with the target conversants, by having advance information about the probable content of their speech, or by situating oneself so that conversants are to the right rather than to the left or to the rear.

Reporting information from target conversations can be improved by strengthening the memory--paying more attention to the conversation, emphasizing its organization, and using mediators, images, and mnemonics.

Finally, listeners can help establish the credibility of their reports by indicating their confidence in the accuracy of their recall and by noting how the target message was delivered and who delivered it to whom.

RR 1216. Warnick, W. L., & Kubala, A. L. (Human Resources Research Organization). Studies in long-range target identification. July 1979. (AD A073 860)

This report describes three long-range vehicle recognition programs developed to provide training in armored vehicle recognition and identification at extended ranges (2,000-4,000 meters) for air cavalry personnel whose duties include aerial observation.

The first program used photographs (35mm slides) of models on a terrain board because using a helicopter with a 13X TOW Sight (TSU) was not adaptable to classroom training. Participants used a pretest, training, and posttest design.

The second program was developed in conjunction with a target handoff study. This program was a self-instructional and presented in a slide/tape format. It was divided into two 40-minute segments.

The third program was a pilot study conducted to determine the ranges at which vehicles could be recognized at night employing the TSU/CAV NAV Goggle combination. The study was conducted under approximately 40% of full-moon illumination.

Findings from the first two programs showed that attack helicopter crewmen can identify armored vehicles at standoff ranges employing the TSU. However, these crewmen must be trained to make distinctions with the minimal cues available at these ranges. Findings of the third program showed that because none of the participants was able to identify any vehicle at the minimum range of 500 meters, the use of the TSU/CAV NAV Goggles for long-range vehicle recognition at night does not appear to be feasible in most conditions without some artificial illumination.

An instructor's guide for a long-range recognition and identification training program is provided as an appendix.

RR 1217. Chastain, G. D., & Kubala, A. L. (Human Resources Research Organization). Effects of fatigue from wearing the AN/PVS-5 night vision goggles on skills involved in helicopter operations. July 1979. (AD A075 426)

Reviews of the literature on rotary wing flight and interviews with aviators were conducted to determine which helicopter tasks and maneuvers are performed most frequently and/or are the most critical. Those found to be most critical were analyzed into perceptual and psychomotor components, and a battery of perceptual and psychomotor tests was selected to measure these factors.

Ten aviators were tested both before and after flying with the AN/PVS-5 goggles. Eye-hand coordination was marginally affected following flight, and reaction time to lights was significantly affected.

RR 1218. Scott, T. D., Meliza, L. L., Hardy, G. D., Jr., & Banks, J. H. Armor/anti-armor team tactical performance. July 1979. (AD A075 354)

A field experiment determined the effectiveness of REALTRAIN engagement simulation training and identified tactical team performances associated with mission accomplishment.

Eight armor/anti-armor units received a pretraining tactical test, 5 days of tactical training using either REALTRAIN or conventional methods, and a posttraining test.

REALTRAIN units were more likely to accomplish their mission. Successful units displayed sound tactical behavior in attack planning, initial deployment, use of cover and concealment, surveillance, and use of firepower, regardless of type of unit or mission.

RR 1219. Shriver, E. L., Jones, D. R., Hannaman, D. L., & Griffin, G. R. (Kinton, Inc.); & Sulzen, R. H. (ARI). Development of small combat arms unit leader tactical training techniques and a model training system. July 1979. (AD A075 429)

This report describes development of simulation techniques for training small-unit leaders in tactical decisionmaking while minimizing troop participation. Basic instructional principles underlying engagement simulation were used to construct a mapboard game abstraction of field exercises. The game was a two-sided, free-play map exercise for teaching infantry tactics to platoon leaders, as originally conceived; junior officers could play the game to learn tactical skills that they would later apply during REALTRAIN exercises with troops.

However, for best results leaders appeared to need to learn to work with their noncommissioned officers (NCOs) and then to practice in the field, both with and without troops. A variation of the basic game enabled the unit team of platoon and squad leaders to work together on the game board as they would during an actual engagement. Concurrently, a field training technique, focused on leader/subordinate interaction, was explored. The field opposition exercise involved only key leaders on each side, without troop support.

A combined arms mapboard game was also developed to help familiarize junior officers with the nature of tactical operations that integrate mechanized infantry, armor, and anti-armor elements against a deployed enemy.

The research produced (a) an infantry squad/platoon level mapboard game for two-player or multiplayer use; (b) an infantry squad/platoon level field opposition exercise; and (c) a combined arms platoon/company level mapboard game. Separate documents are available on each of the three training techniques.

RR 1220. Hennessy, R. T., Hockenberger, R. L., Barnebey, S. F., & Vreuls, D. (Canyon Research Group, Inc.). Design requirements for an automated performance measurement and grading system for the UH-1 flight simulator. June 1979. (AD A072 318)

This report describes the development of an automated performance measurement and grading system for instrument flight training in UH-1 flight simulators (UH1FS).

A survey and analysis was conducted of the hardware and software architecture of the UH1FS and the Basic and Advanced Instrument maneuver profiles used for instrument flight training. Design requirements were developed for an automated performance measurement system that produces a composite maneuver grade and diagnostic error messages. The system is based on final criteria referenced performance and measurement of the aircraft variables that are the critical indicators of performance. An estimate is included of the maximum and minimum data collection requirements for utility and acceptance testing of the system.

RR 1221. Isley, R. N., & Miller, E. J. (Seville Research Corporation). A field evaluation of the UH1FS Instructor's Guide. August 1979. (AD A082 923)

This report describes a small-scale field evaluation of the UH1FS Instructor's Guide. The Guide was developed for use by instrument instructor pilots at UH-1H flight simulator (UH1FS) field locations. The Guide was designed to serve (a) as an information source or textbook for instructor pilots learning to conduct training in the UH1FS, and (b) as a job aid or reference for use during training. The field evaluation was conducted to determine how well the Guide functioned as a job aid and to develop guidance necessary for preparing similar instructor guides for future Army flight simulators.

UH1FS instructors at two field locations were given draft copies of the Guide. In-depth instructor interviews were conducted after the instructors had used the Guide for about 3 months. Instructor comments on the usefulness of the Guide are summarized. Instructors found the Guide satisfactory in all important respects.

RR 1223. Pieper, W. J., Guard, N. R., Michael, W. T., & Kordak, R. S. (Applied Science Associates, Inc.). *__Training developers decision aid for optimizing performance-based training in machine ascendant MOS__. August 1979. (AD A081 971)*

An analytical process was developed for generating training specifications to assist training development specialists (TDS) in deciding what, where, and how tasks within a Military Occupational Specialty (MOS) are trained. The model was developed in two major segments: (a) a theoretical or idealized model and (b) a procedural model based on the concepts developed in the first segment. The manual model process simply has the TDS work through partition logic charts to generate the training specifications. The computer-aided model requires the TDS to complete a task data sheet for each of the MOS tasks. The TDS is then required to run the programs associated with the model. The outputs produced by the programs are the same as the outputs arrived at by following the partition flowcharts. The three outputs generated by the model are training prescriptions, training hierarchies and sequences, and training costs.

RR 1224. Jorgensen, C. C. *__Early training assessment within developing system concepts__. August 1979. (AD A082 916)*

A proposal for training assessment within early system concepts considers a broad spectrum of training requirements generated by recent Army guidance for determining training impacts at the earliest stages of weapon system specification.

An examination of the state of the art for developing systems included system development impacts, threats, hardware, and training needs. Six methodological areas were evaluated: concept generation, task specification, trade-off analysis, management information, effectiveness estimation, and costing. Strengths and weaknesses were considered for each area. Ways of merging existing techniques were elaborated. Future research areas were identified. Innovative and little-known techniques discussed included both tri-service and foreign research.

A proposal was made for combinations and extensions of existing research to meet projected Army needs.

RR 1225. Shields, J. L., Goldberg, S. L., & Dressel, J. D. *__Retention of basic soldiering skills__. September 1979. (AD A075 412)*

This report describes research to identify task factors that influence the rate of skill decay of basic Army tasks.

Field Artillery Training Center evaluators tested the performance of 523 soldiers on 20 basic common tasks. The sample included soldiers who were completing entry-level training and soldiers who had completed this entry training during the previous 12 months. Training Center evaluators rated task performance "GO" or "NO GO" for each task step and for the task as a whole.

Tasks varied in the rate at which the percent "GO" declined since training. Three factors accounted for most of the differences in retention: (a) number of task steps, (b) order of original training, and (c) presence or absence of subtasks. Soldiers performed most task steps. The steps that are forgotten tend to be those not suggested by the previous sequence of steps or by the equipment.

Commanders can use the research results to determine the relationship between soldier proficiency and time since training. Commanders can schedule training to maintain desired levels of proficiency in critical skills. The eventual research goal is to develop guidelines for determining which tasks require frequent training and which tasks can be maintained at high proficiency for long periods without practice.

RR 1226. Bynum, J. A., & Holman, G. L. Tactical night terrain flight navigation. September 1979. (AD A086 458)

This report documents two experiments conducted to determine the training required to improve tactical night terrain flight aircrew performance. These experiments sought to identify critical factors that should be included in a program of instruction for tactical night terrain flight navigation training with unaided vision.

In the first experiment, a passive navigation task was used to establish an altitude that would provide adequate training with a safety margin, the types of terrain or other features that should be used for checkpoint identification, and the effect of daylight exposure to a route on subsequent navigation performance. Using Experiment I as a building block, Experiment II tested the effects on active navigation performance of light level, type of map, and order in which light level was experienced. Multiple step-wise linear regression was used to determine associations among the variables and provided an accounting of the variance attributable to each variable of interest.

It was concluded that unaided vision navigation is possible at illumination levels as low as 2×10^{-4} foot candles. Instructional programs must consider restrictions to visibility, map type, proper preflight planning, adequate dark adaptation, a standardized intra-cockpit phraseology, and should use natural terrain features with vertical relief for checkpoint identification.

RR 1227. Boldovici, J. A. (Human Resources Research Organization). Analyzing tank gunnery engagements for simulator-based process measurement. September 1979. (AD A082 090)

Automated devices can potentially measure the processes as well as results of armor crew performance. This research analyzed a sample of three tank gunnery engagements to (a) identify the stimuli and overt responses in a sample of gunnery tasks, (b) identify and rank-order the response groups, overt responses, and enabling skills for each duty position in the sample engagements, and (c) write prototype measurement specifications for a sample of those response groups, overt responses, and enabling skills.

The decisions and overt responses of each crew member for the sampled tasks were displayed in several sets of flow diagrams. The diagramming yielded immediate information for the design and use of diagnostic tests: (a) what is to be measured can be determined from inspection of the overt responses, and (b) stimulus materials can be inferred from inspection of the decisions.

Methods for sorting overt responses into groups and for inferring enabling skills were based on three considerations: perception of initiating stimuli, recall of procedures or rules, and motor behavior. These methods yielded a four-tiered behavior hierarchy for each duty position for each engagement. Measures of crewmen's performance at all levels of the hierarchy would permit (a) troubleshooting performance sequences by backtracking scores top to bottom through the hierarchy, (b) testing sequentially from bottom to top, and (c) predicting performance in higher instructional units from scores on lower units.

Measurement specifications were written for the response group, overt responses, and enabling skills in a main gun precision engagement. Each contained a sample test scenario from which display requirements for testing devices may be inferred; a description of the responses to be measured from which control requirements for testing devices may be inferred; identification of the end-point events for measuring elapsed time; and a description of how to assess the accuracy of the response of interest.

RR 1231. Smutz, E. R. __The effect of evaluator attitudes on subjective ratings of unit structure in phase II of the "Restructuring of the Heavy Division" test__. September 1979. (AD A081 975)

This report describes the results of research to investigate the influence of evaluator bias on the results of the Restructuring of the Heavy Division test, Phase II (FT 382A). More specifically, there was a need to determine whether or not field test evaluators held pretest attitudes toward the restructuring concept, and if so, to determine the extent and manner in which these attitudes influenced the ratings that the evaluators gave to various aspects of the concept during the field test.

A questionnaire was administered to evaluators in the Division Restructuring (DRS) test to measure their attitudes toward the division restructuring concept. The questionnaire was administered both before and after the field trials of the test. The questionnaire data were analyzed to note any changes in attitude and to determine to what extent given pretest attitudes were associated with positive or negative ratings of various aspects of the division restructuring concept.

The results showed that in the process of evaluating the division restructuring concept, many evaluators shifted from a neutral position regarding whether the H-TOE or the T-TOE was the better unit structure to a position showing a definite preference for one TOE over the other. However, statistical analyses did not show any relationship between evaluators' pretest attitude scores and evaluators' ratings of unit structure in the field test. It was concluded that evaluator subjective ratings of various aspects of the division restructuring concept in the field test were not a function of any positive or negative personal attitudes that the evaluators might have held before the DRS test.

Technical Papers

TP 318. Kress, G., & Bradshaw, S. C. (ARI); & McFarland, R. L., & Ashley, J. L. (Manned Systems Sciences). The ARI prototype small gun laser engagement system. November 1978. (AD A064 366)

This research and development effort was aimed at determining the feasibility of developing a small gun laser engagement system for field research and evaluation purposes. The prototype system has a capability for (a) realistic shooter performance requirements and weapons signature, (b) realistic simulation of weapons effects in terms of realtime casualty assessment and suppression, and (c) player-carried memory for collecting and recording time, casualty, and player identification data.

The prototype laser simulator demonstrates that the requirements for casualty assessment and data recording necessary for field research can be met using this system. Further research and development are necessary to make the system operational.

TP 328. Pilette, S. S., & Biggs, B. E. (HRB-Singer, Inc.); & Martinek, H. (ARI). The value of special training for the interpretation of UGS employed in a grid. October 1978. (AD A063 594)

Based on an error analysis of data on unattended ground sensor (UGS) operator target detection, a self-paced training program was developed to reduce the frequency and magnitude of operator errors and to increase target detection rate.

A pretest and posttest design was used to assess the training. Two 2-hour scenarios consisting of various numbers and compositions of convoys traveling cross-country were constructed from data collected at a field exercise. Four target workload conditions were systematically varied within each 2-hour scenario. Each operator monitored all four workloads during both the pretest and posttest scenarios.

The self-paced training resulted in improved operator performance in target detection and accuracy of estimating target speed and direction of both practical and statistical significance. The false-alarm rate was negligible under all conditions. The report provides recommendations for implementing this training program.

TP 342. Downey, R. G., & Duffy, P. J. Review of peer evaluation research. October 1978. (AD A061 780)

Peer evaluation research was reviewed from the major perspectives of validity studies, methodology, and situational factors. Most of the research programs were conducted while developing procedures for evaluating training groups (e.g., in Officer Candidate School, the U.S. Military Academy, and the Ranger course).

Substantial concurrent and predictive validity generally was found, with correlation coefficients in the .30 to .50 range. Different evaluation methods (rating, ranking, nominations, and combinations of these techniques) did not differ substantially in either reliability or validity. Evaluation methods did, however, differ in acceptability and feasibility. Situational factors have documented a potential effect on the evaluation process that developers and users of peer evaluations should be aware of. Although many issues surrounding peer evaluations remain unresolved, evidence suggests that these issues can be resolved, and that they do not detract from the conclusion that peer evaluations are a powerful tool in discriminating complex human behavior.

TP 343. Gilbert, A. C. F., Waldkoetter, R. O., & Raney, J. L. (ARI); & Hawkins, H. H. (U.S. Army). Efficacy of a training priorities model in an Army environment. October 1978. (AD A066 784)

The research explored the feasibility of a strategy for assigning training priorities in an Army Military Occupational Specialty (MOS 76V). Data were collected for each of the 183 tasks in the MOS from 80 supervisors and instructors on four rating scales: Task Learning Difficulty, Consequences of Inadequate Performance, Need for Immediate Performance, and Most Appropriate Type of Training. Additional data indicated the percentages of MOS members performing each task in the MOS.

The four-factor model can be used to develop task criticality indices for establishing training priorities in this MOS. The most parsimonious solution used the four factors to predict type of training at three levels (resident school training, other training at the unit, and no training). The most useful single variable in determining training priorities was task learning difficulty--the tasks considered hardest to learn should be taught in the most formal setting.

TP 344. Gilbert, A. C. F., & Downey, R. G. Validity of peer ratings obtained during Ranger training. October 1978. (AD A061 576)

The validity of peer ratings obtained during the Ranger course in predicting subsequent performance in duty assignments was evaluated. Associate ratings and other performance measures in the Ranger course were obtained for 470 officers in FY 1973 and for 313 officers in FY 1976; the two sets of evaluations were then compared.

Associate ratings were found to predict all attributes measured by the performance evaluation form. The highest degree of predictive validity was obtained for ratings on the ability defined as "making decisions and initiating action under pressure." Platoon associate ratings during training were better predictors of ratings of performance or of potential performance than were squad peer evaluations. Both tactical officers' evaluations and total Ranger course grades were found to be significantly related to several scales of performance evaluation, but to a lesser degree than either form of peer evaluation.

TP 345. Gilbert, A. C. F., & Grafton, F. C. Some properties of an officer measure of performance and potential. October 1978. (AD A064 257)

This research evaluated the reliability of a criterion measure of officer performance--the Performance Evaluation Form--and determined whether the instrument could differentiate among the requirements of alternative officer assignments. Officers were rated by the immediate supervisor, another superior officer who knew the rated officer's performance, and two associates; four complete ratings were available for 771 Infantry Branch and 102 Quartermaster Branch officers. Reliability estimates were obtained and factor analysis was performed to determine if different factor structures would emerge in the two different branches or for the different sets of raters.

Results indicated a certain uniformity within each branch as to how each officer was rated by the four sets of raters. This uniformity appears to be true when the two branches are compared. Some evidence supported the idea that the rankings of the attributes differed in the two branches in terms of the officer's potential for future assignments.

TP 346. Sewell, E., & Bradie, R. (Raytheon Company); Harabedian, A. (Human Factors Research, Inc.); & Jeffrey, T. E. (ARI). The effects of photo characteristics upon location determination in a photogrammetric facility. October 1978. (AD A062 255)

This research was designed to determine how well an image interpreter can transfer image points from reconnaissance (stimulus) photography to a small-scale photographic data base. Photographs from vertical frame, oblique frame, and panoramic cameras were used as stimulus imagery. Two levels of target position difficulty were established: A-points, located at terrain or manmade features mutually identifiable on both mission and data-base imagery, and B-points, remote from such mutually identifiable terrain or manmade features.

Transfer of A-points for vertical, oblique, and panoramic photographs was accomplished with good accuracy. Performance was significantly better when A-points in panoramic missions were located in the near vertical half of the image. Transfer of B-points was more difficult. For oblique or panoramic imagery, location errors were markedly greater when the B-points were located in the horizon half of the image.

TP 347. Sewell, E. (Raytheon Company/Autometric); Harabedian, A. (Human Factors Research, Inc.); & Jeffrey, T. E. (ARI). Mission/data-base imagery correlation techniques (M/DICT). October 1978. (AD A064 264)

This report describes research to determine how fast and accurately experienced operators can transfer target positions from side-looking radar imagery, infrared imagery, and a static TV display of photographic imagery to data base photography. The research developed techniques and procedures that help the Analytical Photogrammetric Positioning System (APPS) operator correlate mission imagery with data base imagery and so enhance the accuracy with which the operator can transfer targets from mission to data base imagery.

Of three alternative transfer approaches evaluated, an analytical transformation technique (indirect transfer) was determined to be the most useful for transferring targets from a variety of reconnaissance imagery.

Nine participants directly and indirectly transferred 20 points from three types of side-looking radar and two types of infrared imagery to data base photography. Eight participants directly transferred 20 points from a static TV display of a vertical photograph to a data base photograph.

Indirect transfer substantially improved the location accuracy of targets that were not close to or on a feature identifiable on both the mission and data base imagery, but with a cost in time. Target transfers can be made with useful accuracy to a photo data base from radar and infrared reconnaissance imagery having a wide range of scales and ground resolutions. Operational personnel can use the test results in estimating the accuracy with which targets can be transferred from side-looking radar and infrared imagery to data base photographs. The indirect transfer technique can be used to increase the versatility of the APPS for handling a variety of reconnaissance sensor images.

TP 348. Sewell, E. (Raytheon/Autometric); Harabedian, A. (Human Factors Research, Inc.); & Jeffrey, T. E. (ARI). *Total system accuracy for APPS (the analytical photogrammetric positioning system). October 1978. (AD A063 595)*

This report describes a program to determine the accuracy and speed with which trained APPS operators can find ground coordinate locations for targets detected on a variety of aerial surveillance/reconnaissance displays. A secondary objective was to measure the repeatability of the APPS equipment/operator for both monoscopic and stereoscopic measurements.

Ten participants were involved in three experiments: Experiment I was monoscopic measurement of index marks; Experiment II was stereoscopic measurement of points marked on the data base; and Experiment III involved indirect transferring of points from infrared, panoramic, and radar mission imagery to a data base and solving for ground coordinates of the points.

Based on test findings, the following conclusions were made. (a) Monocular measurements (of index marks) can be made with the APPS equipment with sufficient accuracy so the overall accuracy of ground point determination is not appreciably lowered. (b) The Indirect technique and associated software described in this report provide a practical and an accurate means for determining the ground coordinates of target points in areas of sparse background detail whose images appear on photo, IR, and radar records. (c) Isolated target points can be transferred by the indirect technique to a photo data base and ground coordinates determined well within the 15-minute per point suggested performance rate, including the time for measuring the index marks and check point. (d) Target points in mountainous areas generally can be transferred to a photo data base to acceptable accuracies using techniques described in this report.

TP 349. Gade, P. A., Fields, A. F., & Alderman, I. N. Selective feedback as a training aid to on-line tactical data inputting. November 1978. (AD A061 789)

This report describes research to evaluate alternative on-line computer-assisted training strategies for improving performance of the Message Input Output Device (MIOD) operator in the Tactical Operations System (TOS).

Training as MIOD operators was given to 53 Army enlisted personnel under one of four methods that were based on different instructional strategies. Performance of each participant was assessed during training and under one of two operational configurations of the TOS.

Results showed that the response-sensitive training strategy was effective in reducing training time without loss of performance accuracy during transfer-testing. None of the training methods significantly reduced the amount of undetected errors that enter the system through manual data entry.

TP 351. Sulzen, R. H., & Bleda, P. R. Effects of combat simulation on the work-related motivation/satisfaction of participants. March 1979. (AD A071 084)

This experiment was part of a series of validation tests of the REALTRAIN program, a tactical engagement-simulation training method. A written test that measured six dimensions of job-related motivation and satisfaction was administered to 128 soldiers before and after their participation in either REALTRAIN or conventional rifle training exercises. Comparison of pretest and posttest results showed REALTRAIN participants to have more positive posttest responses in Attitude Toward the Exercises, Military Work Role, Unit Cohesiveness, and Leader Improvement components; and no change in the Satisfaction with Leadership and Career Intentions components. Conventionally trained participants showed no change in five components and a decline in posttest response to Leader Improvement. REALTRAIN gives soldiers greater motivation to work, more job satisfaction, and a better attitude toward the Army than does conventional training.

TP 352. Savell, J. M., & Woelfel, J. C. (ARI); & Collins, B. E., & Bentler, P. M. (University of California, Los Angeles). Male and female soldiers' beliefs about the "appropriateness" of various jobs for women in the Army. August 1979. (AD A075 406)

This report compiled data on women's role in the Army, examined attitudes of male and female soldiers about jobs for women in the Army, and related the attitudes to aspects of the personal and professional characteristics of the respondents. In 1974, 800 soldiers at three Army installations were administered a 174-item questionnaire on sex-role attitudes. Some of the gathered data showed whether soldiers thought certain jobs were appropriate for women, and data were reanalyzed to explore these findings.

Respondents had indicated whether they thought 24 listed jobs were appropriate for women. Results showed respondents considered traditional female jobs more appropriate than nontraditional jobs on the list but found only one job inappropriate, rifle-carrying infantry foot soldier. Judgments were strongly related to respondents' educational level and sex; soldiers who had more education more often judged the jobs appropriate than did soldiers with fewer years of education, and women more often judged the jobs appropriate than did men. The judgments were not related to respondents' military rank (when educational level was controlled), length of time in the Army, nor intention of making the Army a career.

TP 353. Barber, H. F., & Kaplan, I. T. *Battalion command group performance in simulated combat*. *March 1979. (AD A070 089)*

The individual and group behaviors of 27 battalion command groups were studied by eight observers in a simulated combat environment provided by a computer-driven battle simulator, the Combined Arms Tactical Training System (CATTS). Of the 61 subtasks described in the Command Group Module of the Army Training and Evaluation Program (ARTEP), 50 were evaluated in the CATTS exercises. Nineteen subtasks were identified as relatively weak on the basis of their comparatively low performance ratings, and 23 subtasks were found to be highly correlated with the overall effectiveness ratings. Fourteen subtasks were identified as critical because they were both low rated and highly correlated with overall effectiveness ratings. The critical subtasks included identifying, gathering, analyzing, and disseminating intelligence; planning fires; determining the critical place and time; communicating plans and orders; defeating electromagnetic intelligence; reacting to jamming; and concentrating combat power. These subtasks were related to more basic processes, identified in previous research as important determinants of organizational effectiveness, for example, sensing, decisionmaking, communicating, and coping with changes in the environment.

The critical performance identified in this report could be given particular emphasis in the development of command group training systems, training programs, and information-processing and decision-aiding technologies.

TP 354. Tierney, T. J., Jr., Cartner, J. A., & Thompson, T. J. *Basic Rifle Marksmanship Test: Trainee pretest and posttest attitudes*. *April 1979. (AD A069 941)*

The Basic Rifle Marksmanship (BRM) Test was conducted to examine trainees' attitudes about four programs of instruction (POI) for BRM. Pretraining and posttraining questionnaires were given to approximately 3,400 male and 1,000 female trainees at Fort Jackson, S.C., and to trainees who participated in the skill retention phase of the BRM. They were asked about their backgrounds, self-confidence, enjoyment of training, and opinions on cost and program effectiveness.

Trainees generally liked marksmanship training and considered it effective, regardless of the POI completed. They did not find pressure from instructors helpful and thought night fire and automatic fire instruction were inadequate. Male trainees liked marksmanship training more than did females and were more confident in their skills, possibly because men had had more experience with rifles than did women. Results suggest that night and automatic fire training should be redesigned and that providing practice in terminal marksmanship qualification tasks can improve motivation.

TP 355. Kaplan, I. T., & Barber, H. F. *Evaluation of a computer-assisted battle simulation: CAMMS versus a CPX*. *April 1979. (AD A068 014)*

The Computer-Assisted Map Maneuver System (CAMMS) creates a simulated battle to train battalion and brigade command groups in the exercise of command and control. In contrast to a conventional manual command post exercise (CPX), which is driven by predetermined messages, CAMMS calculates weapons effects, movement rates, and logistical support in real time to give the command group realistic feedback about the consequences of its actions. This investigation compared the costs and the training effectiveness of CAMMS and CPX.

Questionnaires were administered to 50 battalion command groups and 12 brigade command groups after they participated in CAMMS exercises. Data analysis showed that participants judged CAMMS to be significantly and consistently more realistic and more interesting than CPX. CAMMS was superior to CPX in preparing and organizing the battlefield, controlling and coordinating combat operations, concentrating combat power, and in the exercise of command and control rated by the commander.

Neither system produced adequate stress, exercised security procedures, or required reaction to special situations, such as chemical warfare. A CAMMS exercise cost 25% to 30% less than a CPX, however, primarily because of less preparation time. Overall, CAMMS produced a superior exercise at a moderate cost saving over the CPX.

TP 356. Potash, L. M., Farrell, J. P., & Jeffrey, T. E. *An approach to assessment of relief formats for hardcopy topographic maps*. *April 1979. (AD A069 462)*

This research developed an appropriate methodology and made an assessment of the legibility of different relief formats.

The types of relief information that must be extracted by representative users of hardcopy maps were analyzed. Using the results of this analysis, a Relief Assessment Test was designed to determine the merits of supplementing contour lines with other relief formats. The Relief Assessment Test contains eight types of problems: landform identification, ridge-valley identification, slope identification, identification of high-low areas on the map, spot elevation problems, vertical profile identification, terrain visualization, and defilade. Use of the Relief Assessment Test assumes previous experience and training in the use of contour line maps, but the test does contain a review of relevant aspects of map reading. When this test is administered as a self-paced test, participants typically take 3 to 5 hours.

The Relief Assessment Test was produced in three formats: contour lines, contour lines plus layer tints, and contour lines plus shading. Initial research was undertaken to assess these three map formats empirically.

Participants were 48 Army officers and NCOs experienced in reading contour maps and using them for land navigation. The participants were tested in small groups, each being told to work at his own rate of speed. Each participant was assigned to one of the three map formats.

The results indicated that addition of layer tints to contour lines can increase speed of extracting some types of relief information. On the other hand, addition of shaded relief does not increase map reading speed more than use of layer tints, and can cause a decrease in accuracy.

TP 357. Huntoon, R. B., & Schohan, B. (Rockwell International Corporation); & Shvern, U. (ARI). Visual search performance in simulated remotely piloted vehicle utilization as a function of auxiliary task loading on the observer. April 1979. (AD A072 402)

Baseline data were obtained on how well observers could extract information from a TV monitor while performing auxiliary tasks under task loading conditions that might be encountered in use of a remotely piloted vehicle (RPV) as the sensor platform.

A simulation facility was used. It contained a terrain model, a TV camera transport, hybrid computing equipment, and a television display and control console.

Six pilots and six nonpilots participated in the three-phase effort. Phase A required participants to detect and recognize tank-sized targets in open and cluttered backgrounds from a simulated altitude of 2,000 feet and a simulated RPV velocity of 100 knots. Phase B required participants to monitor and correct deviations in the RPV course and altitude and to respond to two visual warning indicators. Phase B tasks were presented at two rates: one per 10 seconds and three per 10 seconds. Phase C combined the tasks of Phase A and Phase B with concurrent task demands upon the participants.

It was found that increasing the auxiliary load level decreased the probabilities and ranges of target detection and recognition. Target acquisition task demands similarly increased auxiliary task response times. Cluttered background significantly degraded target acquisition task performance, particularly when the auxiliary task was performed concurrently.

TP 358. Cockrell, J. T. Effective training for target identification under degraded conditions. April 1979. (AD A071 085)

This research investigated the concept of overshadowing and the role it might play in target identification training. The concept of overshadowing holds that trainees pay attention to the most obvious distinctive feature of a particular target and pay little attention to less obvious features. The dominant feature is said to overshadow the less obvious features.

The concept was investigated by training four groups of subjects to identify targets. Each group was trained on a different view of the same targets, with more and more of the distinctive features being covered in order to force attention to the less obvious features. All groups were tested on the same 100%, 67%, and 35% views of the targets.

Groups trained on partly concealed targets made the best final scores, and groups trained entirely on completely visible targets made the worst scores on 35% visible targets. Results agreed with the overshadowing concept and indicated that the best way for trainees to learn to identify degraded (difficult to see) targets is to train on degraded targets. Training on wide-open targets may waste time or even be harmful; possibly all training should be concentrated on different views of degraded targets.

TP 359. Moore, M. V., Nawrocki, L. H., & Simutis, Z. M. *The instructional effectiveness of three levels of graphics displays for computer-assisted instruction*. *April 1979. (AD A072 335)*

This report compares the instructional effectiveness of three different types of computer graphics for computer-assisted instruction (CAI).

Three groups of 30 enlisted personnel studied a CAI lesson on the psychophysiology of audition. Three versions of the lesson were developed; each version differed only in the type of graphics used. Graphics were either low level (boxed alphanumerics and schematics), medium level (line drawings), or high level (line drawings plus animations). Upon lesson completion, retention of four knowledge categories addressed in the CAI lesson was tested.

Groups did not differ in their performance on the final retention tests or in lesson completion time. Performance was, however, related to General Technical (GT) score. Therefore, the addition of more realistic and sophisticated graphics displays to a CAI lesson did not insure an increase in instructional effectiveness.

TP 360. Fischl, M. A., Ross, R. M., & McBride, J. R. *Development of factorially based ASVAB high school composites*. *April 1979. (AD A072 315)*

This research developed revised Armed Services Vocational Aptitude Battery (ASVAB) subtest composites for the specific purpose of high school vocational guidance.

The ASVAB (Form 5) administered to high school students consists of 12 subtests. To develop subtest composites that would be most suitable for high school counseling, dimensions of ability underlying the test battery were defined through the use of factor analysis. This methodology was substantially different from previous sets of composites developed to relate to specific military job groupings. The data analyzed were from a sample of more than 2,000 10th, 11th, and 12th graders generally representative of the national population of high school students.

Researchers found five nonoverlapping clusters of tests that best defined each of five factors. The factors were (1) Verbal Ability--knowledge of words and reading comprehension; (2) Analytic/Quantitative Ability--general reasoning and mathematical knowledge; (3) Clerical Ability--speed and accuracy in using letters and numbers; (4) Mechanical Ability--understanding mechanical principles and visualizing objects in three-dimensional space; and (5) Trade Technical Knowledge--relevant to automotive information and shop practices. A sixth composite, not drawn from the factor analysis, called Academic Ability, helps the counselor understand the level of education or training most appropriate to the student.

TP 361. Shiflett, S., Downey, R. G., & Duffy, P. J. *The effects of multidimensionality on the predictive and construct validity of the LPC scale.* *May 1979. (AD A072 313)*

Research investigated properties of the Least Preferred Coworker (LPC) scale as potential predictors of group performance and satisfaction. The LPC scale uses an evaluation of a specific individual with whom one cannot work well, made by each member of a group, to develop a scale or measure that has been variously interpreted but that has shown fairly consistent relationships with group performance.

A 32-item version of the LPC scale was administered to 260 Army reservists during a field training exercise. LPC factor scores were examined in relation to performance criteria for formal leaders as well as the most endorsed and least endorsed group members.

LPC factor scores appeared interpretable along several different dimensions, and the dimensions seemed to correlate differentially with various criteria. The LPC factor scores yielded a five-factor structure that is similar to structures found in other fields of psychological research. The respondent's role within the group appears to have an effect upon which subscale is related to which criterion.

The discovery of this particular five-factor structure may represent a major step toward resolving the enigmatic quality of LPC by tying it to existing literature not dealing specifically with the LPC scale. There may be relationships between leader behavior and specific LPC dimensions.

TP 362. Peters, J. I., Bleda, P. R., & Fineberg, M. L. *Effects of illumination level and sense of direction on land navigation performance.* *May 1979. (AD A071 104)*

The ability of foot soldiers to move at night affords unique military advantages because of the natural cover provided by darkness and because this ability allows the Army to perform continuous (around the clock) operations. This research quantitatively assessed the ability of infantrymen to perform a navigation task in conditions of limited visibility without the aid of night vision devices. Simulation of night was also tested by having the soldiers wear light-attenuating devices, and individual differences between good and poor navigators were studied with regard to the soldier's personal history, attitudes, and performance on cognitive tests aimed at discriminating sense of direction.

The experiment required 30 soldiers to perform a dead-reckoning task to four checkpoints over a 2,330 meter course in mountainous desert. Ten soldiers navigated during the day, 10 navigated at night, and the remaining 10 navigated in the day but wore light-attenuating devices to simulate night. Half the soldiers in each group had a poor sense of direction, according to their own self-ratings, and the other half a good sense of direction.

The results indicated that although both navigation speed and accuracy were degraded to some degree, only navigation speed was significantly affected by night illumination. Compared with daylight performance, those in the simulated night condition performed like those navigating in actual night. Navigators with a good self-rated sense of direction tended to perform better than those with a poor self-rating. Only navigation experience was significantly correlated with performance. Neither cognitive style nor city versus country childhood were predictive of navigation ability.

TP 363. Bleda, P. R. *REALTRAIN improves soldier attitudes toward the Army. May 1979. (AD A072 334)*

Although the Army is concerned primarily with improving the combat readiness of its units, there is a growing orientation toward enhancing the job motivation and satisfaction of soldiers.

A paper-and-pencil instrument was constructed to measure various dimensions of job-related motivation and satisfaction. This instrument was administered to soldiers either before or after their participation in combined arms exercises. This instrument was used in two separate field investigations. One study examined the impact of REALTRAIN (platoon and squad level battlefield simulation) alone on motivation/satisfaction responses, and the other compared the relative impact of both REALTRAIN and conventional training.

The results indicated that along six of the nine motivation/satisfaction dimensions, responses were more positive following participation in REALTRAIN than before its implementation. Along the remaining three dimensions, no change was observed in the before and after measures of motivation/satisfaction. However, for the conventional exercises, no change was seen in the before and after responses of participants along five of the six motivation/satisfaction dimensions. Along the remaining dimension, a decline occurred in the satisfaction level evidenced by participants in the conventional training.

TP 364. Yekovich, F. R., Walker, C. H., & Blackman, H. S. *The role of presupposed and focal information in integrating sentences. May 1979. (AD A071 182)*

This report describes research to identify factors that affect the comprehensibility of written materials and to develop guidelines that writers can use to make texts easier to understand.

Adult participants read 50 two-sentence texts, presented by tachistoscope, controlling the beginning and ending of each pair of sentences. The time they required to understand each second sentence in relation to the first (integration) was measured.

One experiment varied the linguistic characteristics of information common to both sentences of a pair. For some pairs, the common information was linguistically marked as "old" (presupposed) in both sentences; for some pairs, the common information was identified as "new" (focal) in both. Some pairs linguistically identified the common information as new in the first sentence and as old in the second, and some reversed the marking, identifying the common information as old in the first and new in the second. As a control condition, some sentence pairs had no information in common. Sentence sets combined these five conditions; that is, five separate first sentences were constructed representing the five conditions, and each was paired with a specific second target sentence. This technique assured that variations in target reading time were a direct function of the first sentence of the pair.

Additional experiments varied the proximity of the common information across the two sentences (Experiment I) and used different syntax in the target sentences (Experiment II).

Findings showed that the linguistic characteristics of the common information affected comprehension in consistent ways. Essentially, comprehension was fastest when the common information was introduced as focal in the first sentence and then repeated as a presupposition in the second sentence. When the common information across sentences occupied only one of these two linguistic positions, comprehension was significantly slower. Finally, when the common information was introduced as presupposed in the first sentence and then used as a focus in the second, comprehension was still slower, as slow as the control condition. The general pattern held for texts of various lengths and for sentences with varied syntax.

TP 365. Medlin, S. M. Behavioral forecasting for REALTRAIN combined arms. *May 1979. (AD A074 407)*

Board war games can be used in generating benchmark performance data against which unit performance in engagement simulation (ES) field exercises can be evaluated.

Using the Fort Carson Forecasting Game, board war game exercises identical in content to the field exercises in the Combined Arms Test conducted at Fort Carson, Colo., in March 1978 were carried out. The field and board exercises were compared to determine similarities and differences between the two types of exercises. Results were obtained in terms of maneuver routes, casualties suffered, and casualties inflicted by each type of weapon system.

Findings showed that although the maneuver routes of the field exercises were slightly more complex than the board game routes, the routes from the two types of exercises were similar. Casualties suffered were almost identical for field and board game exercises, and casualties inflicted by each type of weapons system were also quite similar. The only sizable differences were the percentages of casualties inflicted by tanks and by artillery. The similarities suggested that board war gaming is a feasible technique for developing benchmarks; the differences indicated that the board war game needs revisions to provide more accurate forecasts.

TP 366. Moses, F. L., & Maisano, R. E. User performance under several automated approaches to changing displayed maps. June 1979. (AD A073 726)

Performance in a route selection task was used to evaluate automated methods for changing from one displayed segment of a map to another. Participants were 24 Army officers who chose successive 6.75 x 9 km map segments (1:50,000 scale) for solving 12 problems. Each problem requested the fastest road route between pairs of cities within a 60 x 81 km region. Participants solved problems by electronically marking road routes across map segments. Methods for changing map segments were (a) continuous map scanning and (b) discrete map segments using three different amounts of border overlap (0%, 25%, and 50%).

Results showed that different map change conditions did not significantly affect the quality of routes chosen. The least time for problem solutions occurred when map segments with 50% overlap were used, although 25% overlap produced similar data. Designers of map display systems for the military could optimize user performance time with discrete map segments that overlap by about 25%.

TP 367. Cory, B. H., & Johnson, C. D. (ARI); & Korotkin, A. L., & Stephenson, R. W. (American Institutes for Research). Duty modules: An approach to the identification and classification of personnel resources and requirements. June 1979. (AD A073 745)

A job analysis concept called the duty module was developed for representing work activities at a level more specific than a Military Occupational Specialty (MOS) and more general than a "task." This early phase of the research (a) developed and refined the concept, (b) developed methods and formats for applying the concept to Army jobs, and (c) evaluated its feasibility and utility for analyzing Army jobs. Specifically, the research evaluated the feasibility of using a set of duty modules to adequately represent duty positions in an infantry platoon and of using job content data in duty module format for evaluating unit performance.

A duty module is developed by examining task inventory and job analysis data for several different specialties and grouping together those tasks that cluster meaningfully. Duty modules should be mutually exclusive. They must be specific enough to describe the essential work activities of a position and general enough to apply across various positions and occupational specialties.

Thirty-one enlisted and 93 officer duty modules were developed, field tested, and revised. Field reactions were highly favorable for using the officer duty modules to describe work activity requirements. In addition, techniques for employing duty modules to describe both unit capabilities and performance worked well in a pilot test during a field training exercise.

TP 368. Downey, R. G., Duffy, P. J., & Shiflett, S. Construct validity of leader effectiveness criteria. June 1979. (AD A075 420)

This research investigated whether different measures of leadership effectiveness from different sources provide comparable data.

Data on leader effectiveness were gathered during a 2-week field exercise from three different sources (leaders, peers, and subordinates), using several different techniques (questionnaires on leader performance, leader self-ratings, and peer evaluation of leader effectiveness). These data were analyzed in a multitrait-multimethod fashion.

Findings showed that the rating situation and raters' perceptions interact with leaders' behavior and evaluations. Most types of measuring techniques seemed to evaluate the same basic variables, with the exception of peer evaluation of leadership potential. Exact amounts of interchangeability could not be determined.

The data suggested that different methods of measuring leadership may be subject to different kinds of bias, and that using more than one method and source in the assessment may be essential to measure all aspects of leader performance.

TP 369. Gade, P. A., & Gertman, D. *Listening to compressed speech: The effects of instructions, experience, and preference*. *August 1979. (AD A075 408)*

To help the Army make effective use of current technology in time-compressed speech, researchers explored the variables that affect the processing of time-compressed communications, such as listening rate preferences, prior experience with compressed speech, and listener motivation.

Forty-eight Army enlisted personnel were asked to listen to four passages of speech in a self-paced situation. They were told to listen to the passages at rates that would allow them to process the information as rapidly as possible with no loss in comprehension. Before listening to these four passages, half (N = 24) of the participants were required to listen to speech compressed to twice the normal rate; the other half listened to speech at the normal rate. Half of each of the two groups (N = 12) were given instructions designed to induce epistemic curiosity motivation. The remaining 12 participants in each group were given neutral instructions. All participants were given 10-item, multiple-choice comprehension tests at the end of each speech passage. After listening to the fourth speech passage, participants were asked to indicate their preferred listening rates.

Findings showed that speed and accuracy in listening to compressed speech were not affected by the epistemic curiosity conditions. Prior exposure to compressed speech led to consistently faster listening rates on each of the four passages of speech. Preference data indicated that personnel preferred to listen to speech at rates well above the normal speaking rate. However, prior exposure to compressed speech did not affect subsequent preferred listening rates.

TP 370. Root, R. T., & Knerr, C. M. (ARI); & Severino, A. A., & Word, L. E. (U.S. Army Training Support Center). *__Tactical engagement simulation training: A method for learning the realities of combat__. August 1979. (AD A075 606)*

Training combat arms units requires a different approach from conventional instructional system development (ISD) practices. Unit performance may be more than the sum of individual performances. In battle, subunits interact, and unit and subunit behavior is contingent on the behavior of an intelligent adversary. Conditions that initiate complex combat behavior can rarely be specified in advance.

The idea of "emergent" rather than "established" situations provides a framework for considering situationally determined unit behavior. The empirical approach called engagement simulation involves the detailed observation and recording of "naturally occurring" tactical behavior in what military experts agree is a valid, if incomplete, representation of combat. The simulation procedures provide for data collection and analysis.

From this data collection and analysis, critical combat behaviors should stand out, to be used to describe the full range of tactical behaviors for which training must be provided. The patterns of occurrence of critical combat behaviors may help explain how or why a particular outcome came about in a given situation.

This identification of critical combat behaviors in the emergent situation represented by combat may be able to provide improved specification of training content (documented in improved Army Training and Evaluation Programs), improved training diagnosis, and improved determination of unit readiness.

TP 371. Gilbert, A. C. F. *__Relationship between officer duty performance and certain measures of potential__. July 1979. (AD A075 409)*

As part of on-going research on prediction of leader effectiveness, the performance of 5,000 officer students in the Army Officer Basic Course (OBC) was measured by the seven scales of the standard Officer Evaluation Battery, OBC final grades, and peer ratings made halfway through the course and at the end of the course. Later duty performance was assessed by the standard Officer Efficiency Report and the special-purpose Performance Evaluation Form.

Statistical correlations indicated that duty performance was predicted best by final peer ratings and next best by grades, both in general and for personnel in noncombat arms branches. For combat arms personnel, however, final peer ratings and course grades appeared about equally predictive. These findings confirm other research on the value of peer ratings.

TP 372. Dyer, F. N., & Hilligoss, R. E. *__Using an assessment center to predict field leadership performance of Army officers and NCOs__. May 1979. (AD A071 086)*

This report describes research to determine how effectively an Assessment Center can predict field leadership.

During 1973 and 1974, the U.S. Army Infantry School (USAIS) Assessment Center (ACTR) at Fort Benning, Ga., tested 408 officers and noncommissioned officers (NCOs) who were students in USAIS leadership courses. Field leadership performance ratings for these participants were then obtained at 6- and 18-month intervals following graduation and assignment to new units. Complete rating data were obtained at 6 months for 159 of the original participants and at 6 and 18 months for 108 of these participants. Correlations between these ratings at 6 and 18 months averaged .66 for the different participant groups, indicating a substantial degree of reliability for the rating instrument. Field leadership performance at 6 months was predicted by items in an entry interview, a paper-and-pencil test, and a Person Description Blank.

Taken together, however, the results indicate only marginal utility for the USAIS ACTR for prediction of the field leadership performance of junior officers and NCOs. Typically, the more assessor time required for a participant measure, the less chance that the score would predict field leadership.

TP 373. Helme, W. H., & Uhlaner, J. E. Relationship between leader knowledge, directive behavior, and performance in administrative, technical, and combat situations. September 1979. (AD A085 101)

This paper analyzes data acquired in previous ARI officer prediction research to learn to what extent two broad characteristics of officer behavior--military knowledge and directiveness/decisiveness--are associated with superior performance in the three major areas of officer assignments--combat, technical, and administrative.

Out of 600 lieutenants, four groups of officers were identified: those possessing high knowledge and high decisiveness, high knowledge and low decisiveness, low knowledge and high decisiveness, and low knowledge and low decisiveness. Performance scores and observations of decisiveness obtained for each officer were analyzed with respect to officers' technical and tactical knowledge.

Superior performance was found to be positively related to both military knowledge and decisiveness. Knowledge, whether technical or tactical in content, was more important in administrative and technical situations. Decisiveness was markedly more important in combat situations. The analysis confirmed the importance of matching an officer's leadership style and qualifications to the requirements of an assignment to insure effective performance.

TP 374. Bleda, P. R. Simulating various moon illumination levels with light-attenuating devices (LADs). July 1979. (AD A075 421)

To reduce the problems of safety, logistics, and evaluation inherent in training at night, ARI has developed experimental light-attenuating devices (LADs) that simulate night visual conditions during the day. Single-density or bidensity lenses can be fitted to existing facemasks and used to conduct certain night training operations during the day with greater safety and convenience and little reduction in effectiveness.

LADs were used experimentally on 1,556 soldiers divided into three groups in training and testing night rifle marksmanship during basic Army training at Fort Jackson, S.C. Filter densities effectively approximated night illumination with a full moon, a quarter moon, and a new moon; trainees using LADs performed as well as trainees performing under actual night conditions.

TP 375. Bleda, P. R., & Farrell, J. P. Development of light-attenuating devices (LADs) to simulate night visibility during daylight. July 1979. (AD A075 327)

To reduce safety, evaluation, and logistics problems in nighttime training, ARI has developed light-attenuating devices (LADs) to simulate night visual conditions and allow daytime training. Both single-density and bi-density lenses have been developed for a variety of facemasks. This report documents ARI's role in developing and fabricating LADs and discusses potential applications for training.

Using LADs to simulate night visibility for night training and testing may be more advantageous than actual night training for several reasons. First, safety: with single-density LADs, someone with full vision can monitor trainees' performance. Second, performance evaluation: instructors working in daylight can better observe and evaluate trainees' performance. Third, convenience: daylight is a more convenient time for many qualifications tests.

TP 376. Kaplan, I. T., & Barber, H. F. Training battalion command groups in simulated combat: Identification and measurement of critical performances. June 1979. (AD A075 414)

This research developed methods to measure Army Training and Evaluation Program (ARTEP) performances and to determine the relative criticality of these performances.

The behavior of 23 battalion command groups was investigated in a simulated combat environment provided by the Combined Arms Tactical Training Simulator (CATTS). Thirteen mechanized groups performed a covering-force operation followed by an attack, and 10 nonmechanized groups performed a defense and an attack. Their performance was rated on items derived from the subtasks of the battalion command group ARTEP. Fifteen subtasks were identified as critical, because they or their elements both rated low on performance and were highly correlated with ratings of overall effectiveness.

The four missions observed were markedly different in subtask criticality. All but 1 of the 15 subtasks were identified as critical in the covering-force mission, 5 subtasks were critical in the mechanized attack, 1 in the defense, and 1 in the nonmechanized attack.

The same command group was rated significantly differently by several observers who judged the exercise from different points of view. Further research should (a) develop more objective measures of performance and (b) identify those subtasks for which the different perspectives of the raters would produce valid differences in performance ratings.

TP 377. Martinek, H. (ARI); & Pillette, S. S., & Biggs, B. E. (HRB-Singer, Inc.). *The effect of signal/noise ratio and bandwidth on vehicle identification, using the acoustic sensor. June 1979. (AD A073 715)*

Three experiments were conducted to determine the effect of variations in signal-to-noise (S/N) ratio and increased bandwidth on the ability of operators using the remotely monitored acoustic sensor to identify vehicles in convoy. In general, the operator was to discriminate between the following seven military vehicles traveling in typical convoys: jeeps, gamma goats, 2½-ton trucks, 5-ton trucks, 10-ton trucks, armored personnel carriers, and tanks. Targets were presented at each of four levels of S/N ratio: +6 decibels (dB), +12 dB, +18 dB, and +24 dB. The operational bandwidth of 50 to 2,000 hertz (Hz) was compared to that of 50 to 4,500 Hz. Special training under all of the above conditions was given.

The results indicated that completeness of operator identification declines as the S/N ratio decreases, approximately 1% per 1.5 dB of S/N ratio. No differences were found in use of the two bandwidths. Use of automatic gain control should be limited because the operator uses loudness variations to discriminate among targets.

TP 378. Erwin, D. E. The importance of providing stereoscopic vision in training for nap-of-the-earth flight. July 1979. (AD A072 316)

This report describes research to determine (a) whether or not stereoscopic visual displays would be more cost and training effective than the bioptic displays usually employed in aircraft simulators, and (b) whether stereoscopic displays should be developed for helicopter simulators.

Stereoscopic movie films were taken of passing terrain from the cockpit of an OH-58 flying nap-of-the-earth (NOE) at speeds of 20, 40, and 60 knots. Observers compared stereoscopic presentations of the films to bioptic presentations and found the depth perceived in the stereoscopic film much more compelling. This study demonstrated that it is possible to perceive stereoptic three-dimensionality with the stimulus environment available through the windscreen of a helicopter flying NOE. Observers were then asked to make motor reaction times when they perceived three-dimensionality in stereoscopic slides of wooded terrain. These reaction times were compared to the motor reaction times of binocular fusion and a simple flash of light to determine if the perception of stereoscopic three-dimensionality has a measurable "rise time." A "rise time" of approximately 400 msec was measured. Catch trials were used to insure that observers waited until three-dimensionality or fusion was perceived before responding. This result suggests that a discrete interval is required after "seeing" something to perceive three-dimensionality. This interval may or may not be available to observers, depending on the rate at which they scan the visual environment.

TP 379. Potash, L. M. Effects of retrieval term specificity on information retrieval from computer-based intelligence systems. July 1979. (AD A072 312)

This research assessed the impact of using two levels of retrieval terms for formulating and inputting seminatural English query statements.

Thirty-six enlisted personnel with General Technical (GT) scores of at least 110 were randomly assigned to two groups. One group was allowed to use only specific terms for retrieving items of information (specific group). The second group was allowed to use both specific and global terms to retrieve blocks of information that would otherwise require use of several related specific terms (global-specific group).

Two or three participants were tested per day. Each one was given a Data Element Dictionary containing the retrieval terms, a Data Name Chart displaying these retrieval terms and their interrelationships, and a test booklet.

Before the experiment, participants took a 5-minute typing test. The participants then went through the instructional portion of the test booklet, which taught them a simplified version of the query language used in ASSIST and how to use both the dictionary and the name chart. Next, participants wrote and typed query statements that would satisfy the information requirements of 48 problems. An electric typewriter simulated the keyboard input of a computer terminal. Using a stopwatch, each participant timed how long it took to (a) write and (b) type each query statement.

After finishing the performance section of the test, participants were tested for incidental learning of the retrieval terms. They were also asked to rate the ease of writing and typing query statements and the advisability of using global terms, and to indicate what strategies they used to write the query statements.

Results showed that opportunity to use global retrieval terms, typing speed, and GT scores had no significant effect either on the time required to write the query statements or on the number of query statements correctly written. However, where global terms were applicable, their use saved substantial time in typing query statements. Both specific and global-specific groups rated highly the value of using global terms.

TP 380. Shvern, U. Field evaluation of the Combat Commander's Guide to Aerial Surveillance and Reconnaissance Resources. July 1979. (AD A075 422)

This research evaluated the Combat Commander's Guide to Aerial Surveillance and Reconnaissance Resources on its usefulness, accuracy, clarity, and completeness.

An evaluation questionnaire was prepared and distributed, with copies of the Commander's Guide, to 100 officers at U.S. Army units in Korea, Germany, Fort Hood, Tex., and Fort Bragg, N.C. Participants were required to have either command experience at the battalion level or above or G3/S3 experience. The questionnaire included a structured evaluation of the main sections of the Commander's Guide as well as a global assessment of the document. Participants could elaborate their answers or comment on topics not specifically addressed. Sixty questionnaires were returned--27 from battalion commanders and executive officers and 33 primarily from officers in G3/S3 assignments.

The individual sections of the Commander's Guide were judged to be more useful than the document as a whole, with both the structured rating scales and from the open-ended comments. Raters considered the Commander's Guide to be more suitable for the G2/S2 than for the battalion or brigade commander. Raters' comments concerning possibly excessive detail for a commander's needs were consistent with this finding. Also, reference to specific AS&R assets are outdated in many instances. Rapid changes in the AS&R area dictate frequent revision of any publication that refers to specific equipment.

TP 381. Knerr, C. M., & Root, R. T. (ARI); & Word, L. E. (U.S. Army). *An application of tactical engagement simulation for unit proficiency measurement. July 1979. (AD A075 410)*

This report discusses techniques for objectively measuring the combat proficiency of Army units and teams.

The training system called tactical engagement simulation (ES) also assesses the training results objectively, using casualty exchange ratios and mission accomplishment data as "product measures." Armor/anti-armor exercises, for instance, use records of casualties, time, and mission accomplishment to measure the total skills of the units. ES training and assessment procedures have been developed for infantry and armor/anti-armor units and are under development for other types of unit and mission.

"Process measures" to assess performance and skills during a mission are also necessary to help diagnose problems and explain product data, and to assess noncasualty-producing missions. For instance, the performance of armored cavalry, whose primary mission is reconnaissance and security, must be judged entirely by process measures. The records and observations of process measurement also provide a way to note and evaluate external factors such as weather that affect the mission.

Difficulties in measuring team performance using existing judgmental techniques have been a fundamental problem in diagnosing proficiency. ES measures may aid the situation greatly.

TP 382. Medlin, S. M. *A partial validation of forecast engagement simulation exercise outcomes. August 1979. (AD A075 411)*

Research was conducted to evaluate the validity of board war game data for use in determining benchmarks or standards against which unit performance in engagement simulation exercises can be compared.

Sixty-six military experts attempted to distinguish between engagement simulation exercise data from the Combined Arms Test and board war game exercise data generated by the Fort Carson Forecasting Game. An inability to differentiate between field and forecast data suggests that the two data sources can be considered to be identical and, consequently, that generated data can be used to develop behavioral benchmarks.

Judgments were made on maps of maneuver routes and tables summarizing casualties suffered and weapon system inflicting casualty data. The military experts were not able to correctly classify maneuver route information as real (field) or simulated (game board) data. Furthermore, they tended to classify simulated casualty data as real.

Results from this study indicate that board war gaming provides realistic process and product data that military experts cannot distinguish from field exercise data.

TP 383. Hart, R. J. Crime and punishment in the Army. July 1979. (AD A071 263)

The relationship between crime and punishment indicates a dilemma: labeling theory suggests that leaders who enforce the law respond to crime by increasing punishment under the assumption that punishment deters crime, whereas recipients of this punishment often respond with a feeling of injustice that incites them to break the law more frequently and more seriously.

The operation of this dilemma in a U.S. Army population was tested with cross-lagged panel correlation, using companies (groups of about 200 soldiers) as the unit of analysis. In 50 companies, company leaders punished their subordinates, particularly blacks, as a response to the lawlessness they attributed to these subordinates, while subordinates responded to this punishment in the ensuing months with a sense of injustice and increased lawlessness.

An examination of the interaction within the companies revealed (a) that little consensus existed between superiors and subordinates over offense rates; (b) that leaders punished enlisted soldiers, particularly blacks, as a response to lawbreaking labels they applied to these soldiers; and (c) that leaders (first sergeants) felt punishments were effective in improving discipline. The labeling of blacks resulted in a racially discriminatory pattern of punishments. Enlisted soldiers reported responding to the punishments by feeling that (a) punishment was applied frequently within companies that had good discipline (felt by white enlisted soldiers), (b) punishment was handled unfairly, and (c) labels of insubordination had been applied to them by their leaders. Under these conditions, rather than conform as their leaders expected, enlisted soldiers responded defiantly by increasing subsequent offenses. The punishments also increased the premature discharge of soldiers from the Army.

Technical Reports

TR 386. Pfeiffer, M. G., Siegel, A. I., Taylor, S. E., & Shuler, L., Jr. (Applied Psychological Services, Inc.). Background data for the Human Performance in Continuous Operations Guidelines. July 1979. (AD A075 454)

This report presents the technical data and literature review necessary to develop the handbook Human Performance in Continuous Operations Guidelines. The literature concerns the effects on individual performance of the stressors associated with continuous (around the clock) Army operations. Critical tasks associated with a typical continuous operation are identified, along with the results of a study on the influence of various continuous operation stressors on performance effectiveness. Needed research into the effects of various continuous operations stressors on soldier performance is described.

TR 387. Schulz, R. E., Hibbits, N., Wagner, H., & Seidel, R. J. (Human Resources Research Organization). On-line authoring aids for instructional design. July 1979. (AD A075 466)

Research was undertaken to examine the feasibility of providing "how to do it" guidance (authoring aids) for the instructional design and development tasks identified by the Interservice Procedures for Instructional Systems Development (IPISD) model. The usefulness of the IPISD model depends on authoring aids that enable training personnel to translate IPISD procedures into instructional products. The authoring aids developed by this research should be useful for computer-based and off-line instruction and be generalizable to different subject matter areas.

Authoring aids were constructed, implemented, and tested. The authoring aids were developed to be used on the PLATO IV Computer-Assisted Instruction (CAI) system. The first step produced flowcharts that detailed the steps of the IPISD Blocks II.2 (Develop Tests) and III.4 (Develop Instruction). On-line author aids as well as off-line versions were produced to help the author prepare materials for CAI and non-CAI delivery of instruction.

Three levels of evaluation were conducted. An informal evaluation on existing IPISD materials was performed, and a formative evaluation on the newly developed authoring aids. Finally, the instructional materials were evaluated by military authors and administered to U.S. Army Engineer School trainees.

These evaluations demonstrated the feasibility of on-line aids for implementing IPISD Blocks II.2 (Develop Tests) and III.4 (Develop Instruction). User acceptance of the aids was high, and the time required for development of test and lesson material was significantly reduced.

TR 388. Milligan, J. R., & Waldkoetter, R. O. Observer self-location ability and its relationship to cognitive orientation skills. September 1979. (AD A075 740)

This report presents research on the ability of field artillery observers to locate military targets and to relate that location to their own position by use of military maps.

The researchers divided 30 observers into categories of either high or low self-location abilities (median split) on a previously administered practical exercise. The participants' ability was then measured on three tasks: (a) use of a pointing instrument to point the direction to a series of local landmarks familiar to them, (b) use of a pointing instrument to point to a series of cities within the United States, and (c) a visual imagery exercise that required them to follow mentally a complex set of directions and then report their direction at the conclusion of the exercise.

Results revealed statistically significant overall differences between the two groups of observers on all three tasks. Those participants who scored high on the previous self-location exercise also scored high on the three experimental tasks. The pointing instrument and visual imagery tasks were therefore successful in distinguishing between subjects who scored well and those who scored low on previous self-location exercises.

TR 389. Hemingway, P. W., & Kubala, A. L. (Human Resources Research Organization). A comparison of speed and accuracy of interpretation of two tactical symbologies. July 1979. (AD A075 428)

The speed and accuracy of interpretation of two tactical symbologies were compared. One set of symbols was the standard set described in U.S. Army Field Manual 20-30. The other set was designed on the basis of previous research in symbology. A brief battle scenario was selected, and for each symbol set 35mm slides were prepared representing updates in a tactical display. Each of 32 participants viewed only one set and answered questions about changes in the situation as the displays were updated. Both response time and response accuracy scores were obtained. Half the participants viewing each set were men and half were women. All participants were screened to insure a lack of familiarity with the traditional symbols and for normal color vision and visual acuity.

Results showed that accuracy of response to the two symbol sets did not differ. Male and female participants were equally accurate in reporting changes. Response time was significantly faster for displays containing the experimental symbols. Women were faster and less variable than men in responding to both the traditional and experimental symbol sets.

TR 390. Nieva, V. F., Myers, D., & Glickman, A. S. (Advanced Research Resources Organization). An exploratory investigation of the Skill Qualification Testing System. July 1979. (AD A075 662)

This report describes research to explore initial reactions to the Skill Qualification Test (SQT) and its components, and to learn how well the SQT system operates in the field.

Semistructured interviews were conducted with 52 enlisted men. The interviews were designed to provide information on user reaction to the various components of the SQT system: the Soldier's Manual, the SQT Notice, and the test itself. They were also designed to uncover information about the way in which the SQT system was operating and the SQT-related activities on post.

Results of the interviews indicated that instructors used the Soldier's Manual most, while the enlisted personnel used the manual primarily for reference. Those soldiers who realized the function of the SQT Notice found it useful. Reaction to the SQT was generally favorable, although test-related problems were identified. More soldiers who had formal training for the SQT reported passing the test than soldiers who had prepared for the test on their own.

TR 392. Atwood, M. E., Turner, A. A., & Ramsey, H. R. (Science Applications, Inc.); & Hooper, J. N. (ARI). *An exploratory study of the cognitive structures underlying the comprehension of software design problems. July 1979. (AD A073 727)*

An experiment evaluated a framework for the study of software complexity and comprehension. Basic to this framework was the concept that a person's knowledge of and experience with software design affect that person's ability to comprehend a software problem and its potential solutions. Past research has largely assumed that software complexity is a function of surface properties, such as variable names and flow of control. Such measures, however, ignore the effects of experience.

Research on expert-novice differences in problem-solving suggests that experts possess a large number of previously developed knowledge structures, or schemata, that can be used to understand or solve the current problem. Research on text comprehension provides theoretical concepts and experimental paradigms that are useful in determining the structure and content of these experience-related schemata.

An experiment examined the knowledge structures used by participants at differing levels of experience in comprehending software systems specifications. Six participants at each of five levels studied a software system specification and then summarized both the presented specification and the probable form of the corresponding software design. The results indicated that software designers used previously learned schemata in understanding a software design problem and in actually constructing a design, and that these schemata differ as a function of experience.

The structure and content of these schemata were also investigated. By determining the structure and content of such schemata, software complexity and comprehensibility could be considered in a more meaningful manner.

TR 393. Medlin, S. M. Combat operations training effectiveness analysis model: 1979 perspective. July 1979. (AD A077 839)

This report presents the current status of theory and research relevant to the Combat Operations Training Effectiveness Analysis Model (COTEAM), an evaluation system for small combat units.

The current Army Training and Evaluation Program (ARTEP) has several weaknesses. COTEAM is based on the ARTEP framework but corrects its shortcomings by providing (a) a realistic simulated combat environment in which units perform tactical operations and objective data can be obtained, (b) procedures for defining standards against which unit performance can be compared, and (c) techniques for assessing training deficiencies and levels of training or combat readiness.

A review of the current status of the COTEAM evaluation system indicates that research is being conducted on all aspects of the model. The ARTEP manual is being modified to provide empirically determined behavioral objectives, a list of training diagnostic behaviors, objective standards, and a program of instruction for ARTEP evaluators. The COTEAM simulated combat environment exercises are superior to ARTEP field exercises in promoting tactical proficiency, terrain appreciation, and use of cover and concealment; in providing immediate, valid feedback to individuals and weapon systems; in enhancing troop motivation; and in allowing ample opportunity for collection of objective data on unit performance. A set of systematic methods for defining specific performance criteria against which unit performance can be compared is being developed, validated, and implemented. A process is being explored for comparing behaviors observed in field exercises to performance criteria, to allow decisions to be made about the training level and combat readiness of the unit being evaluated.

TR 395. Mace, D. J., Harrison, P. C., Jr., & Seguin, E. L. (Institute for Research). Prevention and remediation of human input errors in ADP operations. August 1979. (AD A081 730)

This report describes research to reduce the number and seriousness of the data entry errors made by operators and users of automated battlefield information processing systems.

The operator requirements and procedures of a representative sample of automated data processing systems were examined and a classification developed for categorizing human errors at the operator/computer interface of battlefield automated systems. The analysis considered such factors as the types of errors (character level, message level, etc.), properties of errors (frequency, criticality, etc.), and the impact of the errors on system output.

The Tactical Operations System (TOS) was used as a focus. It was determined that (a) the basic causative factors associated with each type of input error can be identified; (b) techniques for detecting and remedying such errors are available (although some are prohibitively expensive for most applications); and (c) a procedure exists that holds promise as a means for assessing objectively the relative cost-benefits of alternative error reduction techniques.

TR 396. Martinek, H. (ARI); & Zarin, A. (U.S. Army). *The effects of bandwidth compression on image interpreter performance. August 1979. (AD A077 840)*

Research was performed to determine the effect of bandwidth compression on the interpretability of digitized imagery.

Conventional imagery differing in resolution (8-inch ground resolved distance [GRD], 16-inch GRD, and 24-inch GRD), digitized and treated to represent four levels of bandwidth compression (1:1 = no compression, 4:1, 8:1, and 12:1) was interpreted by 12 experienced image interpreters. A Greco-Latin square design was used to control for differences between interpreters, imagery subsets, and period effects at each GRD and to test the effects of bandwidth compression.

The dichotomized image variables of sun angle, image contrast, and target obscurity were distributed equally across all conditions, but could be analyzed only for the 24-inch GRD imagery. Significant decreases were found in the number of correct identifications due to bandwidth compression; the largest decrease occurred between 4:1 and 8:1 bandwidth compression ratios. System developers should make careful trade-off evaluations in using bandwidth compression.

TR 397. Landee, B. M., Samet, M. G., & Foley, D. R. (Perceptronics, Inc.). *A task-based analysis of information requirements of tactical maps. August 1979. (AD A086 502)*

A task-based approach for specifying and analyzing map information requirements was developed and demonstrated. A review of literature on the mapping process included methods for selecting environmental data to be shown on a map. Seven tactical tasks, representing common battlefield functions performed by different users and echelons (e.g., determination of enemy avenues of approach by a G2 officer at the division level), were sampled and analyzed in depth. A military role-playing and doctrinal verification procedure was used to divide tasks into subtasks so that corresponding information requirements could be specified. Each subtask (e.g., identification of obstacles to movement), in turn, was broken down into basic tactical questions about the environment (e.g., "Are there any vegetated areas through which the enemy cannot pass?" "Are there any slopes enemy vehicles cannot climb?"). The data required to answer each question defined the information categories (e.g., vegetated areas, slopes) and levels of detail (e.g., tree spacing and trunk diameter, percent slope) necessary for successful task completion.

The resulting map-related information requirements were synthesized to generate representative map development guidelines. This synthesis--which emphasized information about vegetation, road networks, and built-up areas--was accomplished across tasks to identify those specific information needs that show either prominent commonality or uniqueness with respect to different tasks and user groups. Within the framework of these task-based comparisons, examples illustrate the types of implications that can be derived from the task-based analysis of information requirements.

TR 398. Moses, F. L., & Potash, L. M. Assessment of abbreviation methods for automated tactical systems. August 1979. (AD A077 840)

Alternative methods of producing abbreviations of single words for use in automated military systems were empirically evaluated. Each of 50 enlisted men performed three tasks designed to assess five different abbreviation methods, including two versions of truncation, two versions of contraction, and one procedure based on current Army practice. In the first four methods, abbreviation length was directly related to word length. In Task A, participants used a 10-point scale to rate preference for abbreviations for each of 60 terms. Thirty of these terms were repeated in Task B; the other 30, in Task C. Task B required participants to decode 60 abbreviations into their original terms. Finally, Task C asked participants to encode (i.e., generate) a meaningful abbreviation for each of 60 terms.

Results showed that abbreviations produced using simple truncation were consistently preferred, easily decoded, and frequently used for encoding terms. Scores for abbreviations from current Army practice were among the lowest except in Task C (encoding). Experience with abbreviations in Task A (preference) made decoding of identical abbreviations significantly easier in Task B, but did not affect the abbreviations encoded by participants in Task C. Simple truncation is the method suggested to produce good single word abbreviations quickly and to reduce the errors and the time requirements for user interactions with battlefield automated systems.

TR 399. Singer, R. N., Gerson, R. F., & Ridsdale, S. (Florida State University). The effect of various strategies on the acquisition, retention, and transfer of a serial positioning task. July 1979. (AD A081 995)

To analyze the effectiveness of various learner strategies upon initial learning, retention, and subsequent transfer of a motor skill, 50 college-age participants were randomly assigned to one of five strategy conditions: imagery, kinesthetic, labeling, informed-choice, and control. The task, with a curvilinear repositioning apparatus, required participants to replicate six limb movements to predetermined criterion locations. Following the learning trials, participants were administered a retention test, followed by a transfer task involving 6 new criterion positions.

Separate analyses for each of four dependent variables--absolute error (AE), constant error (CE), variable error (VE), and percentage of correct responses--revealed "imagers" to be more accurate and less variable in their responses than the four other groups. However, control participants displayed greater accuracy and less variability than either the kinesthetic, labeling, or informed-choice groups. Such results suggest the importance of implementing strategies that are compatible with individual cognitive styles.

TR 400. Shiflett, S., Turney, J. R., & Cohen, S. L. *Use of self-report technology in the development of an organizational action-research program. September 1979. (AD A086 879)* (Published as ARI Research Product 81-2)

This research examined the dimensional characteristics of several self-report techniques of potential value in a diagnostic questionnaire to be used in organizational effectiveness (OE) research and intervention.

A survey questionnaire administered to 320 enlisted personnel stationed in West Germany contained items from the OE-derived Work Environment Questionnaire (WEQ) and a variety of criterion measures of satisfaction and motivation.

Analysis of the responses showed that the organizational variables fell into nine broad categories, of which two--quality of life and supervision--were significantly related to measures of satisfaction and motivation. The supervision factor primarily applied to job-related factors such as effort, while the quality of life factor concerned non-job-related factors such as intention to reenlist.

TR 401. Ramsey, H. R., Atwood, M. E., & Campbell, G. D. (Science Applications, Inc.). *An analysis of software design methodologies. August 1979. (AD A081 320)*

Four formal software design methodologies are described and briefly analyzed: (a) Structured Design, (b) Jackson's Methodology, (c) Integrated Software Development System (Higher Order Software), and (4) Warnier's "Logical Construction of Programs." Relative strengths, weaknesses, and commonalities among the methods were identified, and human factors problem areas were analyzed.

Several major human factors deficiencies and problems were identified. Formal software design methods differ in terms of applicability to problems of different types, size, or complexity; susceptibility to design errors; and constraints and limitations imposed on the software designer. Various methods limit the designer's ability to select an appropriate problem representation, prevent the designer from utilizing relevant knowledge and experience, or impose potentially significant information loads on the designer. Improvements in design methodologies require a better understanding of the problem-solving behavior of software designers.

TR 402. Singer, R. N., Ridsdale, S., & Korienek, G. G. (Florida State University). *The influence of learning strategies in the acquisition, retention, and transfer of a visual tracking task. August 1979. (AD A081 994)*

To analyze the effectiveness of various learner strategies upon initial learning, retention, and subsequent transfer of a motor skill, 50 college-age subjects were randomly assigned to one of five strategy conditions: imagery, rhythmic, anticipatory, informed choice, and control. The task, which used a visual tracking apparatus, required subjects to follow a moving target in both visible and invisible conditions. Following the learning trials, subjects were administered a retention test and subsequent transfer task involving the same apparatus.

Separate analysis for the two dependent variables, time on target and absolute error, revealed subjects displayed superior performance (in terms of both dependent variables) during the transfer task. A significant group effect for total time on target appeared to suggest that the rhythmic strategy group was superior to the control group. In general, however, no one strategy was more effective than any other or the control condition in producing learning during the acquisition, retention, or transfer phases in this experiment.

TR 403. Ciccone, D. S., Samet, M. G., & Channon, J. B. (Perceptronics, Inc.). A framework for the development of improved tactical symbology. August 1979. (AD A076 017)

Tactical symbology would be more useful if it were made more compatible with current and emergent tactical doctrine. A structured methodology based on a role-playing exercise was developed for eliciting graphically related tactical information requirements from experienced military tacticians.

The two-stage method used doctrinally approved information-processing guidelines to prompt participants to generate task-related tactical questions (e.g., What is the principal deficiency of a specific enemy unit?) and candidate answers (e.g., mobility, personnel). A pilot test used two experienced staff officers and a European defensive scenario. The numerous question and answer sets obtained were organized into 22 clusters (i.e., data structures), each one specifying questions in decreasing order of detail according to a common tactical theme (e.g., immediate threat, enemy vulnerability, priority targets). These data structures could be building blocks in the development of a dynamic, flexible data base for tactical symbology.

The framework also contains a preliminary analysis of symbol design effectiveness based on a taxonomy of basic information-processing behaviors, which include symbol discrimination, display search, and symbol learnability. A literature review focused on each of these components and its implications, and preliminary guidelines were derived for improving symbol design effectiveness (e.g., minimize the amount of feature similarity among different members of a symbol set). Finally, to help monitor future symbology development efforts, a multifaceted evaluation strategy is outlined that calls for systematic attention to content-based and tactical performance-based assessment criteria.

TR 406. Raney, J. L. *__An algorithm for computerized adaptive decision analysis__. September 1979. (AD A082 924)*

This research investigated an application of recent results in conjoint measurement theory research with the aim of developing a new methodology for (a) modeling a decision process used to evaluate preferences for complex choice alternatives, and (b) producing measurement scales for choice component factors and composite choice alternatives based on the decision model. An algorithm for interactive conjoint measurement (ICM) was developed to minimize the problems of redundancy and random error in testing the additive-independence model (AIM) in pair-comparisons designs with fallible data. No provisions were made for handling the systematic error problem or for accommodating more than two choice component factors. The ICM algorithm was tested in error-free data and in data with random error. The results showed that this ICM algorithm performed poorly.

TR 407. Siegel, A. I., Leahy, W. R., & Wolf, J. J. (Applied Psychological Services, Inc.); & Ryan, T. G. (ARI). *__Application of computer simulation techniques in military exercise control system development: I. NETMAN model sensitivity test and validation__. September 1979. (AD A081 993)*

The NETMAN computer model simulates the information collection and scoring control systems used in tactical warfare training exercises. Extensive testing of the NETMAN model included about 60 different simulations for sensitivity test purposes and one simulation of a real system for validation. The test vehicle chosen for evaluating the NETMAN model's validity was the Marine Corps' Tactical Warfare Simulation, Evaluation and Analysis System (TWSEAS). Message processing information on eight different aspects of TWSEAS was served as criteria in the validation. In the sensitivity tests, the effects of a variety of personnel variables, workload variables, manpower configurations, and task variables were examined for consistency, reliability, independence from trivial effects, and rationality.

In general, the results were found to be reasonable, appropriate, and useful. The most important variables were operator speed, operator precision, and network configuration. The psychological factors of stress threshold and level of aspiration exerted a much less powerful effect on output.

The sensitivity tests also evaluated the ease and the cost of using the NETMAN computer model. The NETMAN program was found to be very efficient in both cost and ease of use. In most cases, extensive iterations are not required.

In the validation, the predictions from the simulation were compared with criterion data of actual TWSEAS use and determined to be acceptably similar 96% of the time for "thoroughness," 90% of the time for "responsiveness," and 100% of the time for message processing time. Overall the results of the sensitivity and validation tests suggested substantial confidence in the NETMAN simulation model.

TR 408. Singer, R. N., Ridsdale, S., & Korienek, G. G. (Florida State University). The influence of learning strategies in the acquisition, retention, and transfer of a procedural task. August 1979. (AD A086 405)

To analyze the effectiveness of various learner strategies upon initial learning, retention, and subsequent transfer of a motor skill, 50 college-age subjects were randomly assigned to one of five strategy conditions: imagery, chunking, verbalization, informed-choice, and control. For the task, a serial manipulation apparatus required participants to manipulate a predetermined sequence of buttons and switches. Following learning trials, participants were administered a retention test. A transfer task was administered to discern the generalizability of specific strategies.

Separate analyses for errors by positions, total errors, and total time revealed that imagers performed better on both acquisition and transfer than the chunking, verbalization, or informed-choice groups.

TR 409. Lippman, A., & Negroponte, N. (Massachusetts Institute of Technology). Graphical input techniques. September 1979. (AD A075 427)

In advanced information process techniques, a graphic work station has been created where three aspects of man-machine interaction may be tested: (a) interaction with a flat display; (b) co-planar input and output; and (c) the ability to "see through your hand" to a display below. All three are created by a suitable arrangement of mirrors to direct a projected television image to a back-projection screen that is in turn optically superimposed onto a data tablet surface via a semitransparent mirror. Uses and benefits of the device are demonstrated by means of a set of games that simulate a situation where a user must interact with dynamically changing data and imagery, and annotation programs where rapid data entry from hard copy is required.

TR 411. Connelly, E. M., & Comeau, R. F. (Performance Measurement Associates, Inc.). Data analysis methodology for day/night inflight tactical navigation. September 1979. (AD A082 731)

Knowledge of the effect of terrain, vegetation, hydrography, and man-made features on the probability of helicopter navigation success is necessary to train student navigators to select flight routes and cues along a route. This research developed and validated methods of analyzing flight data and developed a slide rule for computing subject scores.

Navigation success is defined as navigating along a prespecified route with deviations less than 100 meters. Maps marked with the prespecified and the actual flight routes were analyzed to identify the available navigation cues. Two students flew by day and 10 by night, each using different routes and one of several types of maps. A pilot accompanied each student and noted navigational errors. For this analysis, the routes were divided into intervals to which the available cues (terrain, vegetation, and hydrographic and manmade features) along the route were assigned. Each interval was also categorized according to the number of navigation successes and failures that occurred in that interval. From these data, the probability of navigation success in an interval as a function of the available cues was determined. The data were also used to develop a slide rule suitable for scoring student navigation flights.

Of the 45 terrain features tested, one feature--the proportion of the route in one valley--was the most significant for predicting route probability of success. Terrain cues for navigation should be selected depending on the "proportion of route in one valley" factor. Different terrain features aid or hinder navigation performance depending on that factor. Navigation performance is generally a direct function of the number of terrain features of a given type. The ambient light level did not prove to affect navigation performance. The existence of clearings did not prove to affect navigation performance, but the clearings did serve as dividers, separating possible route paths.

TR 412. Shipley, B. D., Jr. Learning aptitude, error tolerance, and achievement level as factors of performance in a visual-tracking task. September 1979. (AD A081 973)

Learning effects and operator tolerance for error were investigated as confounding factors in measuring visual tracking skill.

Participants were 20 students and 9 attritees from Army helicopter pilot training. Results supported the hypothesis that existing test procedures allowed learning and changes in tolerance for error to be confounded with baseline estimates of operator tracking skill. Modified testing and statistical procedures are recommended. Information on individual differences in tolerance for error are seen as a potentially useful predictor of success in pilot training.

TR 420. Tiede, R. V., Burt, R. A., & Bean, T. T. (Science Applications, Inc.). Design of an integrated division-level battle simulation for research, development, and training: Volume I. August 1979. (AD A082 761)

This volume describes the development and structural framework of a battle simulation design. A companion volume, ARI Technical Report 421, provides more detailed design information.

The design concept provides that any one or any combination of five basic staff modules (Command Group, G2, G3, G1/G4, FSCE) plus one enemy module (Command Group) may be either occupied by human players or simulated. The module simulations are designed as "plug-in" modules, any one or more of which can be replaced by players. The simulation contains a battle outcome generator that simulates all other events within the division and the enemy force opposing it and feeds back to the players the results of their decisions in slow, real, or fast time (at the option of the user). The design also provides for interfaces with higher and adjacent units. It includes the following features. (a) Modules are based on the traditional G-staff structure. (b) Nuclear battle events are included. (c) Live modules may be required to perform simultaneous planning and execution; the results of such planning may be evaluated by subsequent execution of plans.

(d) Other staff elements not included in the basic five modules (e.g., engineer, signal) are "hardwired" components of the simulation. (e) The basic design provides for manual operation by live players but is readily expandable to permit player operation in an ADP-assisted mode.

TR 421. Tiede, R. V., Burt, R. A., & Bean, T. T. (Science Applications, Inc.). Design of an integrated division-level battle simulation for research, development, and training: Volume II. Detailed design notes. August 1979. (AD A082 062)

This volume provides detailed design information for the Intelligence Staff module with respect to a man-in-the loop simulation for research, development, and training. It should be read in the context of the structural framework and the design considerations presented in the companion volume, ARI Technical Report 420.

TR 426. Berkowitz, M. S., & O'Neil, H. F., Jr. An annotated bibliography for Instructional Systems Development. August 1979. (AD A081 183)

This report describes the state of the art in instructional systems development (ISD) and specifies critical research gaps.

A review of the instructional development literature was conducted to produce an annotated bibliography that organized references according to the steps of the Interservice Procedures for Instructional Systems Development Model (ISD, TRADOC Pamphlet 350-30). Each reference was classified as (a) an authoring aid, i.e., a "how-to-do-it" manual that directly guides the author through an activity identified by the ISD model; (b) a procedure, i.e., a listing of the activities involved in ISD; or (c) a technique, i.e., a methodology for accomplishing an activity but lacking sufficient detail to be a procedure.

Findings were as follows. In Phase 1-ANALYZE, authoring aids are available for Select Tasks/Functions; Construct Job Performance Measures; Analyze Existing Courses; and Select Instructional Setting. Authoring aids are unavailable for Analyze Job. In Phase II-DESIGN, authoring aids are available for Develop Objectives and Develop Tests. Authoring aids are unavailable for Describe Entry Behavior and Determine Sequence and Structure. In Phase III-DEVELOP, authoring aids are available for all activities involving print as a medium. However, authoring aids are unavailable for computer-based instructional materials. In Phase IV-IMPLEMENT, and in Phase V-CONTROL, authoring aids are not yet available.

Research Problem Reviews

RPR 78-21. Hart, R. J. Evaluating racial harmony training for Army leaders. October 1978. (AD A076 654)

This research evaluated the effectiveness of two racial harmony training courses for unit leaders: one for company commanders, which included a rather traditional race relations curriculum; and the other for first sergeants, which focused on increasing communication within the chain of command.

An evaluation experiment tested the effectiveness of these training programs and measured their impact on the level of racial harmony within the companies. Forty-five participating companies were randomly assigned to one of four experimental conditions, whether the commander or the first sergeant had or had not received training. Surveys were conducted in the participating companies 2 months later among both company leaders and low-ranking enlisted soldiers from different racial groups. Records relating to the administration of discipline were also collected.

At the end of training, first sergeants reacted much more favorably to the training they had received than the commanders did to theirs. However, the survey data collected 2 months later indicated that a modest favorable effect could be attributed to the commanders' training but not to the first sergeants' training. Commanders who had been trained felt more positive about racial harmony in their companies than did commanders who had not been trained. Apparently the trained commanders had taken some positive action, since enlisted soldiers in their companies indicated positive changes.

RPR 78-22. Hicks, J. M. A survey of the status and utilization of women in the Army. October 1978. (AD A076 655)

This research, derived from the Army's need to better understand the potential contributions of women in the service, specifically investigated the status and utilization of enlisted women.

Enlisted women and enlisted men were compared on a variety of personal, attitudinal, and perceptual dimensions, and data were gathered on the enlistment process, MOS, satisfaction with the Army, and attitudes of each sex toward the other. A self-administered questionnaire, generated from focused group and in-depth individual interviews, was administered in December 1975 to 1,718 enlisted women and 835 enlisted men at nine Army installations.

Researchers found that the women reported a different pattern of reasons for enlisting than did the men, generally stating more concern with self-enhancement and long-term career planning. A smaller percentage of women than men reported working most of the time in their primary Military Occupational Specialty (MOS). A larger percentage of women than men reported satisfaction with the Army. Only about 20% of both the men and women reported feeling that combat occupations could be suitable for women as well as men.

RPR 78-23. Hicks, J. M. Role of women in the Army work force as a function of sex-role stereotypes. October 1978. (AD A076 656)

This report describes research to investigate the effects on civilian women's perceptions of femininity and the desirability of an Army career for women, and of the sight of women wearing typical Army clothing and performing normal Army activities.

Participants were 171 young civilian women, divided into three groups, who watched a series of slides depicting social, neutral, and task-related

Army activities. Each group saw the models in the slides wearing one of three different types of clothing: civilian, Class A uniform, and fatigues. Participants were told that the research was investigating the attractiveness to women of different types of jobs, including the Army. They were asked to evaluate the desirability of the activities shown, and also to evaluate the feminine attributes of the models.

It was found that type of clothing but not type of activity affected the participants' perceptions of the model's femininity. The strongest correlate of reactions to the slides was overall attitudes toward the Army: the more favorable the attitude toward the Army, the more positive the perception of the models and the more favorable the reaction to the slide presentations. Participants possessing pro-Army attitudes tended to be younger, less educated, black, and more antifeminist than did subjects with anti-Army attitudes.

RPR 78-24. ARI Field Unit, USAREUR. Optimum tour length in USAREUR: First term enlisted personnel. December 1978, FOR OFFICIAL USE ONLY.

A cross-sectional survey was conducted of approximately 1,200 first-term enlistees departing their tour of duty in the U.S. Army, Europe (USAREUR) in 1977, to examine combat readiness as a function of tour length. Results were inconclusive.

RPR 78-25. Smith, N. D. State of the art: OPFOR and ARTEP implementation in the U.S. Army. November 1978. (AD A076 657)

The Army Training and Evaluation Program (ARTEP) and Opposing Forces (OPFOR) concept are relatively new, interrelated training programs for the combat arms.

The findings in this report represent the first phase of a continuing research effort to understand how both concepts are being used in normal operations at battalion level and below.

Data were acquired by in-depth interviews from 69 officers and 37 NCO/EN from units at Fort Bliss, Tex., Fort Carson, Colo., Fort Hood, Tex., Fort Riley, Kans., and Panama.

Units were selected from combat arms battalions on as nearly a random basis as training schedules would permit. Infantry, mechanized infantry, and armored units were about equally represented. Of the officer sample, 72% were in battalion command, S-3, S-2, and company command positions; the rest came from positions at brigade, division, and corps.

The OPFOR program, as implemented, was only partially successful in meeting current Army goals. Although most units viewed it as a useful program, higher command emphasis was insufficient, and OPFOR training was generally relegated to a relatively passive classroom role.

Because units generally regarded the ARTEP as a test, it was generally unsuccessful in accomplishing its major training objective: to create a training environment in which units could focus on the diagnostic components of performance in a relatively test-free environment.

RPR 78-26. Erwin, D. E. (Ed.). Psychological fidelity in simulated work environments. December 1978. (AD A076 658)

This report gives the proceedings of a symposium at the annual meeting of the American Psychological Association in 1978 in Toronto, Canada. The subject discussed here, psychological fidelity in simulated work environments, was described in six presentations by members from the military, private industry, and academia.

An introduction, four main papers, and a concluding paper were presented. The four main papers constituted an excellent state-of-the-art review of data, methods, and theory regarding the importance of functional (behavioral or psychological) fidelity versus physical (engineering or hardware) fidelity as a requirement for simulators, or for situations in which some degree of simulation is involved.

The conclusion was that the question of the optimum functional (and physical) fidelity in a simulator for military training can and should be reduced to the question of the cost-effectiveness of the alternatives when used for specific and appropriate training purposes. That requires both the analysis of the cost factors and the measurement of the effectiveness-for-training factors for all alternatives--and for different methods of use. The interests of science, it was felt, could be well served by the adoption of a cost-effectiveness criterion approach to the topic of this symposium and training R&D in general.

RPR 79-1. Yates, L. G., & Hayes, J. F. Optimum distribution of soldiers' duty time: USAREUR commanders' estimates. January 1979. (AD A076 632)

This research obtained estimates from experienced battalion personnel of the percentage of time that should be devoted to each of the numerous battalion activities by E1-E4 personnel in order to fulfill all mission and other requirements. Of particular interest was the amount of time to be devoted to mission-related training.

Data were obtained from questionnaires administered to current or previous battalion commanders, S3s, assistant S3s, executive officers, and battery commanders from each of the major types of U.S. Army, Europe (USAREUR) battalions.

The estimates of percentage of duty time that should be devoted to the individual battalion activities varied with type of battalion. The percentage of time recommended for mission-related training ranged from 31% to 52%.

RPR 79-2. Hicks, J. M. (ARI); Collins, T., & Weldon, J. I. (U.S. Army). Youth aspirations and perceptions of ROTC/military: A comparison. April 1979. (AD A076 633)

This report provides information on what high school and college students think about the Army Reserve Officers' Training Corps (ROTC), and on how ROTC cadets differ from other students, if there is a difference.

Data were gathered from interviews with 2,131 students selected to provide representative samples of high-school-level Junior ROTC (JROTC) cadets, college ROTC cadets, and high school and college students not in ROTC at schools with and without ROTC programs. Students varied by race, sex, and other demographic characteristics.

ROTC and JROTC cadets were predominantly male; significantly more cadets than noncadets were blacks, from lower income families and from the South, and they were more likely to have family or friends in the military. Parents and military personnel most strongly influenced their entering the program and a military career. About a third of the JROTC cadets planned to enter college ROTC, a military academy, or military service after graduation.

Cadets were more likely to feel that their families and friends were positive toward military service, but most said their friends were neutral about it. College cadets' own attitudes were more positive than noncadets'. Noncadets did not possess much accurate information about ROTC. All groups said that military preparedness is a good idea, that ROTC should be an on-campus program, and that the main disadvantages were the restrictions on personal behavior and the image of the program on campus.

More than half the college ROTC students planned to serve more than their minimum active duty obligation on graduation. A fourth of the cadets felt an unconditional duty to serve in the Army, while a majority felt it their duty to serve if needed. Larger proportions of women and nonwhites were undecided about a military career.

RPR 79-3. Griffith, D. Degree of training and Artillery Control Console Operator (ACCO) proficiency. February 1979. (AD A076 634)

This report describes research to assess the proficiency of TACFIRE Artillery Control Console Operators (ACCOs) as a function of amount of training with the TACFIRE equipment.

Operator proficiency at the artillery control console (ACC) was assessed at graduation from formal TACFIRE training and after 2½ months and 5½ months of on-the-job training (OJT). A practical exercise was developed, consisting of 10 processing requirements for the ACCO (e.g., inputting targets into the battalion target file, processing a search of the division artillery intelligence file, establishing a fire plan). Eight of the processing requirements were timed for each operator, and all processing requirements were divided into subrequirements, which were scored for accuracy. Operators were run individually in the TACFIRE computer shelters.

No differences were found among the three groups with respect to processing accuracy. However, enlisted operators were significantly faster after having received OJT than at graduation. No significant differences were obtained between the 2½ and 5½ month OJT groups.

RPR 79-4. Smutz, E. R., & Actkinson, T. R. Evaluator attitudes toward T-TOE and H-TOE unit structures in the Maneuver Battalion Phase of the Restructuring of the Heavy Division Test. March 1979. (AD A076 635)

This research was done to determine the extent to which pretest (pretrial) attitudes of evaluators affected their ratings of the normal table of organization and equipment (TOE) structures that were tested in the Battalion Maneuver Phase of the Heavy Division Test.

A questionnaire was developed to measure the attitudes that evaluators held toward the restructured (T-TOE) and nonrestructured (H-TOE) organizations. This questionnaire was first administered to 64 evaluators just prior to Trial 1 of the battalion maneuver test, again to 59 evaluators just prior to Trial 5 of the test, and finally to 34 evaluators immediately after Trial 8 (last trial) of the test. The data from the questionnaires were then analyzed to determine to what extent evaluator attitudes changed over trials, and to determine to what extent they were associated with positive or negative evaluations of a given TOE.

With repeated observation of TOE structures in the maneuver battalion test, more and more evaluators shifted from a neutral position to a position favoring either the T-TOE or H-TOE structure. With repeated observation of TOE structures, most evaluators (in the attitude surveys) felt increasingly strongly in favor of the TOE structure they had favored prior to the test (for both T-TOE and H-TOE). Throughout the test the majority of evaluators favored the T-TOE structure (in attitude surveys, but not necessarily in field test ratings). Analyses failed to show any relationship between measures of evaluator attitudes toward a given TOE and evaluators' field test ratings of the TOE. It was concluded that the results obtained in the battalion maneuver test were not a function of the preconceived personal attitudes that evaluators held toward or against a given TOE.

RPR 79-5. Griffith, D. TACFIRE OT 056 human factors evaluation. March 1979. (AD A076 636)

This research was an evaluation of the Tactical Fire Direction System (TACFIRE) command and control system for field artillery. It provided a human factors evaluation of equipment, tasks and operating procedures, training, and personnel selection requirements.

Several evaluative techniques were used. Questionnaires were developed and administered that addressed specific human factors issues. These questionnaires were supplemented by interviews and by pertinent data from TCATA questionnaires and data collection forms. Performance assessments were also obtained for individual operators at the Artillery Control Console and on the Digital Message Device. Personnel records and formal course grades were used to analyze personnel selection requirements.

The battalion S-280 shelter was considered unacceptable by battalion Fire Direction Center personnel. The major problem areas cited were the shortage of space within the shelter, the configuration of equipment within it, the air quality, and the noise level (noise levels were in excess of MIL-STD-1474A). Except for the Digital Message Device and the Digital Plotter Map, individual TACFIRE equipment was widely accepted. Although operators maintained that their tasks, on the average, were easy, the consensus of operators was that TACFIRE training must be conducted frequently if skills are to be maintained. Estimates of the necessary training time averaged about 2 days a week at the computer Fire Direction Center and Variable Format Message Entry Device sites and 1 day a week at Digital Message Device sites. Moreover, indications are that more emphasis needs to be placed on maintenance training. Operators who use the standard (QWERTY) keyboard should know how to type. The Army Classification Battery appears to provide a cost-effective means of selecting individuals for TACFIRE schooling.

RPR 79-6. Smutz, E. R. Human factors evaluation of a tactical jamming system (AN/MLQ-34, TACJAM) undergoing operational testing. April 1979. (AD A076 637)

This research identified man-machine interface problems of a tactical jamming system (AN/MLQ-34, TACJAM). Such problems pose possible hazards to system operators and can reduce system effectiveness. The research suggested changes in hardware design, operating procedures, and training procedures that should alleviate these problems.

Data collection methods included questionnaires, interviews, and measurements of hardware. Data were collected on individual hardware components, workspace and equipment layout, environment, safety, operating procedures, training, and organizational maintenance. Five operators were interviewed. Analysis of the data focused on (a) determining what problems, if any, TACJAM operators had in operating the system; and (b) how these problems might be corrected.

Principal conclusions were as follows. (a) Some equipment modification would improve system efficiency. (b) Personnel working near cargo carriers need ear protection because of the noise. (c) The Operator's Manual needs revisions, corrections, expanded explanations, and some reorganization. (d) Expanded training should be provided to explain all panels in the system for better overall understanding and for use in changing fuses. (e) Extra tools should be supplied to the TACJAM maintenance personnel for better maintenance; maintenance manuals need revisions to correct inaccuracies and to insure more complete coverage of maintenance tasks.

RPR 79-7. Marcus, A., & Hughes, C. R. An evaluation of a technique for using the Combat Training Theater (CTT) for periodic rifle marksmanship proficiency training and qualification. May 1979. (AD A075 399)

This report describes an evaluation of an indoor Combat Training Theater (CTT) simulation for record fire of the M16A1 rifle as an alternative to actual record firing on an outdoor range for proficiency maintenance and skill qualification.

Participants were 104 infantry riflemen who were assigned to two different groups and served as their own controls. Each man fired a standard qualification schedule of two phases (practice record fire and record fire) in the CTT and also at a standard outdoor trainfire range facility. For the CTT part of the test, 35mm color slides of typical E-type target presentations were projected on a paper screen to simulate the trainfire range, and soldiers fired a .22 caliber rimfire adapter. Firing was conducted at each facility in the context of normal qualification requirements employed under Record Fire I conditions. The indoor CTT range qualification was expected to closely approximate performance on the standard outdoor record fire range.

Four paper-and-pencil tests were also administered in an attempt to find measures useful in predicting success and failure of rifle marksmen.

Although hit probability scores in the CTT were lower than scores from the standard outdoor range, they were similar in slope to scores obtained earlier at the Army Training Center. That is, the relative difficulty of hitting targets at different distances was effectively the same in the CTT as at the Army Training Center. CTT performance in general was more internally consistent, was better controlled, and required fewer resources than did the outdoor range firing. Correlation between the practice record fire scores and record fire scores was substantially higher in the CTT than on the outdoor range. However, the correlation between CTT and the outdoor range scores was not significant; this was probably due to the unreliability of the outdoor range scores.

Scores on the paper-and-pencil tests did not correlate well enough with marksmanship scores to be useful predictors of performance.

The CTT appears to offer a high potential for cost-effective maintenance of rifle marksmanship skills.

RPR 79-8. Dressel, J. D., & Shields, J. L. Organizational maintenance performance. April 1979. (AD A076 638)

This report describes a way to measure organizational maintenance performance in a brigade-sized unit for use in determining whether a new system of maintenance training had brought about any change in performance.

The repair actions performed on M551 turret end items at the direct support level were recorded for 1 year. The data were derived from the Maintenance Request Form, DA 2407. On a monthly basis, the shop manager of a direct exchange facility at the direct support level forwarded computer-compatible data records to ARI for processing. Maintenance performance charts and tables were returned to the unit monthly.

Findings showed that the nature and number of items turned in for repair varied greatly over the year, as a function of personnel turbulence and unit activity. The total rate of false removals was 42%. The measure of organizational maintenance performance was useful, easy to obtain, and compatible (i.e., did not interfere) with mission performance.

RPR 79-9. Yates, L. G. The estimated impact of SQT on USAREUR infantry units: Survey results. June 1979. (AD A076 963)

This report examines the impact of Skill Qualification Test (SQT) training and testing on U.S. Army, Europe (USAREUR) units.

Data were obtained from questionnaires administered to battalion S-3s, combat company commanders, squad leaders, and E1-E4 service members from 24 of the 31 USAREUR infantry battalions.

Respondents reported receiving moderate benefits with relatively high costs from SQT. Moderate benefits were reported in improved combat readiness and in easier preparation for and performance on various types of training. Program costs were relatively high for man-days and equipment costs. An average of 392.9 man-days per battalion were devoted to SQT by staff from the three combat companies and from battalion level personnel. Cost of materials and equipment was $2,372 per battalion.

Improvement is possible in certain areas of SQT administration. A large percentage of eligible personnel can be tested. Greater efforts can be made to get Soldier's Manuals to recipients 6 months before testing and to assure that all other materials and equipment are available. Additional training can be given to NCOs to better prepare them for SQT training.

It is necessary, but more difficult, to assure that squad leaders get their men together for SQT training and that other activities do not interfere with the training.

The amount of time devoted to SQT training can be increased, as can the quality of training. The amount of hands-on training and TEC usage can also be increased, and more training monitoring done.

Research Memorandums

RM 78-14. Showel, M., & Brennan, M. F. (Human Resources Research Organization). Survey of user attitudes towards Army training literature. October 1978. (AD A075 432)

This report describes the attempt to identify actual user requirements for revised training literature. Further, it gives a detailed review of representative Army training literature and ongoing Army research projects concerned with developing training literature. It documents the first part of a project that identified and analyzed promising methods of instruction for inclusion in training literature and then developed a handbook for writers of training literature--the Guidebook for the Development of Army Training Literature, ARI Special Publication P 75-3, November 1976.

The data were gathered from structured interviews with personnel in two training centers, seven Army schools, and two active Army TO&E divisions, and from a mail questionnaire for Reserve Components. The personnel sample was stratified by role and branch of service.

Findings from Active Army respondents were as follows: Most respondents felt generally satisfied with available publications. Problems were found with obsolescence and keeping up with changes. Students had problems with finding information in publications and with publication readability. Information on specific subjects was spread out in many different publications. Some felt dissatisfied with the physical format of the publications. Literature on doctrine or training programs was found to be lacking. Some publications had little value, insufficient information, or too much general information. Regarding unit training publications, the preferred experimental publication was compact, job relevant, performance-oriented, and specific; it brought together in one place the guidance needed to conduct unit training exercises. There were many requests by NCOs for "how-to-do-it" handbooks.

The problems and recommendations of National Guard and Reservist respondents were very similar to those of Active Army personnel, except that Reservists frequently requested publications specifically oriented to Reserve units.

RM 78-24. Eastman, R. F., & Leger, M. *Validity of associate ratings of performance potential by Army aviators*. *October 1978. (AD A077 971)*

Forty-five AH-1 (COBRA) qualified pilots in FORSCOM units predicted the AH-1 training performance of aviators from their units. The validity ($r = .32$) of ratings in predicting AH-1 flight transition training grades indicates that ratings of potential transition students by COBRA pilots would provide useful information to unit commanders and training officers in selecting aviators for training. The true validity of ratings should be somewhat higher than that obtained in this study, because of limitations imposed by the procedures and available sample.

Highly rated good students were considered to be aggressive leaders, while the low-rated poor students lacked aggressiveness and did not desire gunship duties. However, factors such as dependability and team performance, emphasized by raters, appear to contradict the self-reported impulsive/independence of the ACE group.

RM 78-25. Gray, B. B., & Rigg, K. (Human Resources Research Organization). *Statistical analysis of Fort Hood Quality-of-Life questionnaire*. *October 1978. (AD A077 972)*

The objective of this work was to provide supplementary statistical analyses of data abstracted from the Quality-of-Life questionnaire, developed earlier at the Fort Hood (Tex.) Field Unit at the request of Headquarters, TRADOC Combined Arms Test Activity (TCATA).

The data consisted of the responses of 215 individuals to the Quality-of-Life questionnaire. These data were intensively analyzed using analysis of variance and correlational techniques. The results of these analyses are tabulated in the report.

These analyses will further help to clarify the variables that moderate satisfaction with Army life at Fort Hood.

RM 78-26. Bleda, P. R. (ARI); & Johnson, T. M. (U.S. Army). *__Training in the dark of the day__. November 1978. (AD A077 973)*

To circumvent the safety, logistical, and evaluative feedback problems inherent in training at night, scientists at ARI developed Light Attenuation Devices (LADs) that simulate night visual conditions during the day. Both single and bidensity lenses have been developed for use in a variety of facemasks. This report documents ARI's involvement in the development and fabrication of these LADs.

Following testing of a variety of goggle/mask devices in 1975 and 1977, ARI conducted a night rifle marksmanship field test of LADs at Fort Jackson, S.C., in 1978. Four groups were tested on their performance in rifle marksmanship--three groups had LADs of varying optical densities to simulate varied moonlight conditions; the fourth group performed under actual moonlight conditions. Then the performances of the three LADs groups were compared with the performance of the non-LADs group.

The report also mentioned plans for further testing of LADs, limitations of LADs use, and potential uses of LADs in military testing in a variety of situations.

RM 78-27. Woelfel, J. C., & Savell, J. M. *__Marital and job satisfaction and retention in the Army__. December 1978. (AD A077 974)*

This research provides preliminary data concerning the interactions among (a) Army experiences, (b) family life, and (c) job satisfaction, job performance, and retention in the Army.

Two studies were conducted. The first study identified aspects of Army life that soldiers said were either satisfying or unsatisfying to them in relation to their family life. The second study measured the relationships among Army experiences, marital satisfaction, satisfaction with military duties, and intention to remain in the Army.

The participants in the first study were 116 Army personnel, married, male and female, white and nonwhite, officers and enlisted personnel. Data were gathered from personal interviews. The results indicated several areas of Army life that affect soldiers' lives: separation from family, frequent moves, financial rewards, health care, and housing. But when soldiers' experiences in these areas of Army life were measured, the researchers found the experiences to be unrelated to the soldiers' perceptions of their marital satisfaction.

In the second study, 215 soldiers responded to a questionnaire to test a model that portrayed selected background and family characteristics of the respondents as affecting how they experience the Army and their marital and job satisfaction and intention to remain in the Army. It was found that marital satisfaction was unrelated to any of the Army experience variables or to job satisfaction and retention. However, selected Army experience variables do have an effect on job satisfaction and retention. Job satisfaction emerged as the single most important factor influencing the respondents' intentions to remain in the Army.

RM 78-28. Spencer, L. M., Jr. (McBer and Company). An assessment of the U.S. Army Organizational Effectiveness Training Center (OETC). December 1978. (AD A090 002)

An assessment of the recently established U.S. Army Organizational Effectiveness Training Center (OETC) provided OETC command, faculty, and staff personnel with evaluation data for use in improving the OETC's instructional programs and operations.

Findings were based on interview data, questionnaire data, and OETC historical data. Approximately 150 respondents from five constituent groups familiar with OETC's mission and operations were interviewed. Questionnaire data were derived from 191 respondents.

Results showed that OETC graduates were very well prepared to facilitate structured experiences in small groups, adequately prepared in basic process consultation techniques, generally less well prepared in survey-guided development techniques, and least well prepared in sociotechnical and evaluation methods.

The evaluation concluded that OETC had, in a short time and under considerable pressure, produced a large number of highly motivated graduates to implement OE in the U.S. Army.

RM 79-1. Bolin, S. F. How to brief on research: An essay for researchers. March 1979. (AD A077 975)

This essay presents pointers on giving a successful briefing.

The author advises the following: (a) Deal in generalities. (b) The time left for questions and discussion is the most valuable time in the briefing. Plan for communication time. (c) Repeat important ideas, but never use all the allotted briefing time in giving the pitch. (d) Use more than one example to broaden the important ideas. (e) Pull the net of examples and related ideas together so the listeners have it all in one neat bundle. (f) Vary examples but stay with the theme. (g) Give very little hard data. The briefing is no substitute for the report. (h) Summarize comments by others during the discussion. (i) Avoid recommendations for action by other individuals or organizations.

In a successful briefing, the ranking officer's views are paraphrased, attendees take away copies of the report with them, and they appear interested in reading the report.

RM 79-2. Bleda, P. R. Application of light-attenuating devices (LADs) to night rifle marksmanship training. May 1979. (AD A077 369)

Light-attenuating devices (LADs), developed by ARI, simulate night illumination levels so that night training and testing can be performed during daylight. Previous trials of their feasibility for aviation and infantry tasks were encouraging; in this report a series of field tests at Fort Jackson, S.C., applied LADs to night rifle marksmanship training and testing.

In Field Test I, each of 15 training companies were divided into groups firing for record under simulated and actual moonlight conditions; their performances did not differ significantly. In Field Test II, 468 trainees were divided into four groups (LADs practice and record fire; night practice and record; LADs practice and night record; no practice and LADs record). Results showed that training with LADs was as effective as actual night training. Field Test III retested the 130 trainees still at Fort Jackson 7 weeks later under actual full-moon conditions with no additional practice. While all scores were poorer, trainees who had trained and tested with LADs maintained the same skill levels as those who had trained and tested under actual night conditions.

These results suggest that LADs can effectively save manhours and increase safety, evaluative feedback, and scheduling flexibility without degrading training--in rifle training and in other fields such as tank and aircrew training.

RM 79-3. Bessemer, D. W., & Kraemer, R. E. *The development and validation of audiovisual simulated performance tests using 35mm slides.* *May 1979. (AD A077 976)*

As part of a program of developing Skill Qualification Tests and valid simulated performance tests, this research developed and tried out, as an alternative to hands-on testing, an audiovisual simulated performance test presented on 35mm slides. The tasks to be taught and tested were removal, disassembly, assembly, and installation of the 105mm main gun breechblock mechanism. Results indicated that the audiovisual simulation tests were not a good replacement for hands-on tests but could be used for screening examinees to identify qualified personnel because they predicted subsequent hands-on performance at least as well as prior hands-on tests. Also, because there was no measurable transfer of training from the simulated tests to hands-on tests, the simulated tests might be useful in repeated assessments of unit readiness levels.

RM 79-4. Pilette, S. S., & Biggs, B. (HRB-Singer, Inc.); & Martinek, H. (ARI). *Requirements for target identification training for the acoustic sensor operator.* *April 1979. (AD A077 977)*

The unattended ground sensor (UGS) operator in the field has few opportunities for formal training or structured practice in identifying vehicles using the acoustic sensor. Actual operator performance levels are unknown. To assist in defining requirements, this research was designed to estimate the current performance level of operators under the ideal conditions of identifying vehicles traveling alone (not in convoys) using an acoustic sensor system with a high signal/noise ratio. In addition, the time required to identify a vehicle and the effects of additional training were investigated.

Twenty-four UGS operators identified 120 vehicle sounds which varied by type of vehicle (eight) and length of time presented (1, 3, 6, 10, and 15 seconds); they received 2 hours of training and then were retested on the original 120 sounds.

The training produced large increases in operator performance (average of 31%), and decreased the time required to identify a vehicle (from 15 seconds to 6). Practice effects were found, indicating that practice is needed in the field and that training research in this area must be designed so that training effects are not confounded with practice. Operators required 6 to 10 seconds to identify vehicles after training, depending on the specific vehicle type. Selection, using readily obtained measures, of the top one-third of UGS operators for vehicle identification resulted in a 25% increase in performance over that of the "average operator."

RM 79-5. Knerr, B. W. Adaptive computerized training system (ACTS): Relationships between utility similarity and strategy similarity. April 1979. (AD A077 978)

The Adaptive Computerized Training System (ACTS) is an "intelligent" simulator on which a student troubleshoots a complex electronic circuit by making various test measurements, replacing malfunctioning parts, and making verification measurements. It consists of four components: the task model, which simulates the circuit to be repaired; the expert model, which predicts an expert troubleshooter's decisions; the student model, which observes the student's on-line behavior; and the instructional model, which compares the expert and student models, determines discrepancies, and when complete will modify the instructional program accordingly. Implicit in the concept is the assumption that similar troubleshooting strategies result in similar sets of utilities (gains resulting from outcomes). This experiment investigated that assumption and confirmed a strong positive relationship between utility similarity and strategy similarity, a prerequisite for using discrepancies as a basis for adapting training.

RM 79-6. Narva, M. A. Formative utilization of a model for the prediction of the effectiveness of training devices. May 1979. (AD A077 979)

TRAINVICE, a training device model, has been developed. This model was based on an extensive review of the literature and was the result of analytical work by a team of experienced behavioral scientists.

This report outlines the original TRAINVICE model, its applications, and present suggestions and rationale for a revised model based on a formative utilization of TRAINVICE. The revision was undertaken with a view to enhancing the validity and practicality of application of the original model, based on experience gained in its utilization. Further, the suggested revision aimed to make the methodology more amenable to wider use.

RM 79-7. Narva, M. A. Development of a systematic methodology for the application of judgmental data to the assessment of training device concepts. May 1979. (AD A077 980)

The concept of concurrent development is that training devices should be developed in the same time frame as the materiel systems they simulate, so that trained operators will be available when the system becomes operational. One aspect of implementing this concept is working out standardized methods of judging, early in device development, how effective the training device is likely to be and what changes should be made to improve it.

The TRAINVICE II model provides a framework for applying judgmental data to aspects of the training situation that are believed to affect transfer of skill from the training to the operational situation--whether required skills are covered and properly weighted as to their criticality and difficulty, and how well the physical and functional characteristics of the training device follow guidelines of good practice. The model provides a prescriptive mode of utilization to help formulate training device concepts. More specific guidelines for assessing training device concepts still need to be developed.

RM 79-8. Buxton, W. A., & Miller, E. E. (General Research Corporation); & Hayes, J. F. (ARI). Research on training management techniques for USAREUR: Phase I, design and tryout. May 1979. (AD A077 346)

This report describes the development of a training management approach to enable U.S. Army, Europe (USAREUR) commanders to sustain unit and individual combat skills at the levels necessary to accomplish their assigned missions, while continuing to meet day-to-day demands.

First, a conceptual framework was developed for accomplishing sustainment training and then, on a preliminary basis, the training management techniques necessary to implement that concept. The model dealt primarily with the battalion as the quality control agent.

The proposed techniques were tried out for 1 year, and information gained was used to modify, expand, or discard various elements of the conceptual procedures.

The major finding was that sustainment-oriented training is feasible in a USAREUR battalion, provided (a) the unit is willing to undertake an extensive "front end" task of establishing objectives and operating systems, (b) the battalion and company leaders are willing and able to sustain a high level of involvement in training management, and (c) the leadership is able to sustain a commitment to objectives that are in accord with the Army's goals but in conflict with many of the Army's current practices.

The major product of the year's model development was a prototype battalion training management guide, which contains detailed description and procedures for applying the system.

RM 79-9. Barber, H. F., McGrew, J. F., Stewart, S. R., & Andrews, R. S. The Computer-Assisted Map Maneuver System: A preliminary examination of its training effectiveness and suitability for use as a research vehicle. June 1979. (AD A077 981)

The Computer-Assisted Map Maneuver System (CAMMS) is a battle simulation designed to train commanders and staffs of armor, mechanized infantry, light infantry, and cavalry units at both the brigade and battalion command levels. The command groups play within a nonnuclear environment and against a given enemy force.

This preliminary examination (a) estimated the training effectiveness of CAMMS, (b) refined performance measurement procedures, and (c) estimated the feasibility of continuing to utilize CAMMS as a vehicle for investigating command group training.

Five battalion command groups--two mechanized infantry and three armor--participated. A pretest and posttest design was used.

Based on the findings, the researchers concluded that (a) CAMMS showed evidence of being an effective training vehicle for improving battalion command group proficiency, as subjectively judged in terms of differential performance on ARTEP tasks and subtasks and an overall assessment of the total command group and each major staff element; (b) development of a greater number of objective measures of command group performance in CAMMS is feasible, both to supplement and to ultimately supplant some of the existing subjective ratios; (c) the relationship of command group performance to battlefield outcomes is complex; (d) performance on some ARTEP subtasks appeared to influence battlefield outcomes; (e) organizational process measures as used in this effort did not discriminate performance differences among the various measures themselves or change in performance as a function of the training exercise; and (f) CAMMS has the potential for fulfilling the requirements for a vehicle for training and training research for long-term training effectiveness analysis.

CAMMS may be the only reasonable vehicle for examining the integration of troops on the ground with the play of a battalion level command group simulation.

RM 79-10. Hughes, R. G. A comparison of the human performance requirements for the M60A1 and M60A3 tanks. May 1979. (AD A077 367)

As tank weapon systems change, from the M60A1/AOS to the M60A3 and the XM-1, so do the tasks which the crew performs and which therefore must be trained. The work reported here deals with a pilot investigation of the method used to compare tasks in the M60A1 and M60A3 tank systems. The M60A3 was selected because it was a relatively new system suitable for testing the sensitivity of the classification system to recognize task differences.

The experience gained in this comparison suggested that applying the current task classification system toward development of a training structure for XM-1 had merit, provided certain aspects could be modified. Such changes would include an explanation of the descriptors, a method for weighting characteristics in the determination of the characteristics to be ascribed to the task as a whole, and a method for estimating task complexity or difficulty on the basis of an identification of parameters affecting the "goodness" of task performance.

(A Series)

TR 78-A26. Havron, M. D., Albert, D. D., & McCullough, T. J. (Human Sciences Research, Inc.); & Johnson, E., III, & Wanschura, R. G. (ARI). Improved Army Training and Evaluation Program (ARTEP) methods for unit evaluation. Volume I: Executive summary: Study design & field research. November 1978. (AD A064 271)

This is the first of seven volumes in a study of improved Army Training and Evaluation Program (ARTEP) methods. This study focused on the management of field evaluations according to Training and Evaluation mission outlines in ARTEP 71-2 for training of Tank/Mechanized Infantry battalions. Volume I provides an executive summary of the study, a discussion of study objectives, and a description of the field procedures used to collect information and establish a data base. Issues, problems, and deficiencies in current practices of battalion field evaluations are identified.

TR 78-A27. Havron, M. D., Albert, D. D., & McCullough, T. J. (Human Sciences Research, Inc.); & Wanschura, R. G. (ARI). Improved Army Training and Evaluation Program (ARTEP) methods for unit evaluation. Volume II: Analysis. November 1978. (AD A066 783)

This second volume on improved Army Training and Evaluation Program (ARTEP) analyzes methods for unit evaluation. Principles of ARTEP management are outlined, and issues in applying ARTEP core concepts to field evaluations are discussed, including deciding on an external or internal evaluation, designating key responsibilities, deciding how amounts of assets are committed, and guidance needed to "keep the focus on diagnosis." How to prepare and implement the evaluation plan is explained, with focus on choosing a basic exercise format, constructing an adequate scenario, and providing effective exercise control and tactical simulation procedures.

The scientific concepts used to identify and analyze problems in current ARTEP field evaluations are described. Principles of concepts such as learning theory and systems analysis are summarized, and current training and evaluation outlines are analyzed.

Means of formulating and communicating evaluation results are recommended, and some uses of evaluation results are suggested.

TR 78-A28. Havron, M. D., Albert, D. D., & McCullough, T. J. (Human Sciences Research, Inc.); & Wanschura, R. G. (ARI). Improved Army Training and Evaluation Program (ARTEP) methods for unit evaluation. Volume III: Field guidance. November 1978. (AD A064 272)

This is the third volume on improved Army Training and Evaluation Program (ARTEP) methods for unit evaluation. It is a field guide to be used by unit trainers in preparing and conducting evaluations of Tank/Mechanized Infantry battalion missions drawn from ARTEP 71-2 and by evaluators to improve their evaluations.

The Senior Commanders/Staff module provides guidance on selecting an internal or external evaluation, designating key responsibilities, deciding how many assets to commit, and "keeping the focus on diagnosis." Guidelines are given on the planning and execution of field evaluations, and explanations on how to use the evaluation results to identify unit training strengths and weaknesses and to improve the quality of the evaluation process.

The Evaluator/Controller (E/C) Group module contains an E/C self-study and field reference guide, and a recommended program of instruction for an E/C school. Procedural guidelines are given for using the Training and Evaluation Outlines for the Battalion Task Force, Company Team, and Tank/Mechanized Infantry Platoon in the Defense mission.

TR 78-A30. Bennik, F. D., Butler, A. K., Benesch, M. A., & Silver, L. A. (System Development Corporation). TEC media alternatives for the FY 78-83 period. November 1978. (AD A068 046)

Training Extension Course (TEC) media alternatives were studied to develop procedures for selecting an appropriate mix of delivery systems to meet Army training program requirements for the FY 78-83 period. A Procedure Guide was prepared that can be used for the front-end analysis and design stages of delivery system requirements specification and decisions. With this guide, published as ARI special publication P 78-3, delivery systems can be selected, adapted, or developed depending upon the tradeoff of program training requirements with availability of appropriate delivery systems and practical constraints.

Data on specific Army delivery systems for FY 78-83 were collected and organized into a delivery systems data base (P 78-4), which consists of 12 "Families" containing 42 "Member" delivery systems. These Families contain delivery systems that have both Army-wide and branch-specific applicability. The data base may be used at decision points with the Procedure Guide or independently, as a data base.

An application example (P 78-5) used USAFAS data on Fire Support Specialist (MOS 13F) duties and interactions as part of the Fire Support Team (FIST).

TR 78-A32. Lichtenstein, S., & Fischhoff, B. (Decision Research). Training for calibration. November 1978. (AD A069 703)

Two experiments attempted to improve the quality of people's probability assessments through intensive training. The first experiment involved 11 sessions of 200 assessments, each followed by comprehensive feedback. The subjects showed considerable learning, almost all of which was accomplished after receiving the first feedback. There was modest generalization to several related probability assessment tasks and no generalization at all to two others. The second experiment reduced the training to three sessions. The same pattern of learning and limited generalization was revealed. The results have several implications for training in decisionmaking.

TR 78-A33. Kubala, A. L. (Human Resources Research Organization). Military organizations and systems: Human factors research projects. November 1978. (AD A068 044)

This report summarizes the principal findings of studies at the ARI Field Unit at Fort Hood, Tex., on target handoff techniques, selected problems of armor operations, target identification by helicopter crewmen, detection ranges of features of armored vehicles, and an analysis of a quality-of-life questionnaire. Detailed reports have been published separately.

In the target handoff study (TR 78-A34), an attempt to develop paper-and-pencil tests for selection of personnel to perform handoffs was unsuccessful. Recordings of verbal interchanges during simulated handoffs are being analyzed to determine if there are characteristics of effective verbal behavior during handoffs.

In armor operations, a study on target acquisition revealed no degradation in performance under any of the experimental conditions (TR 78-A35). Interior temperatures in a stationary tank were found to exceed levels necessary for personnel comfort and effectiveness. A research program for developing tank crew Measures of Effectiveness (MOE) was proposed after a literature review showed a need for validated crew MOE. Current training on escape/evacuation of tank crewmen did not exist.

In long-range target identification studies (see TR 78-A36 and TR 78-A37), helicopter crewmen could recognize and identify armored vehicles at scaled ranges of both 3,000 and 4,000 meters; training improved performance to a level of almost 100% correct. Target view was significantly related to recognition and identification performance, but vehicle type was not. The only tank features seen at distances greater than 1,200 meters were tracks versus wheels, turret presence, and turret location. The Soviet bowl-shaped turret was more easily recognized than turrets of other shapes.

Data from a quality-of-life questionnaire administered at Fort Hood, Tex., were analyzed using analysis of variance and correlational techniques. Because only analyses were involved, no conclusions were reached (RM 78-25).

TR 78-A34. Ton, W. H., & Kubala, A. L. (Human Resources Research Organization). Study of target handoff techniques. November 1978. (AD A064 273)

Problems in handing off targets between Army air elements were investigated, and the effectiveness of selection and training in improving performance of target handoff personnel was studied.

A simulator using static imagery was devised to allow pairs of individuals to perform target handoffs. Verbal interchange between the subjects was recorded, and the duration of the handoff was timed. Subjects were 116 Air Combat personnel. They were given a battery of verbal and spatial tests, after which they performed six simulated handoffs in pairs.

The battery of spatial and verbal tests was relatively ineffective in identifying successful handoff performers, and successful utilization of the test battery required selecting only top test scorers. Faster handoffs were found to occur when the observer did most of the talking, when fewer words were used, and when there was a high ratio of adjectives to nouns.

It was concluded that a general, rather than specific, set of rules for possible handoffs is indicated and that handoff simulation is effective in the study of target handoff.

TR 78-A35. Warnick, W. L., & Kubala, A. L. (Human Resources Research Organization). A study of selected problems in armor operations. November 1978. (AD A065 838)

Four studies of problems in armor operations pertained to sealed-tank internal/external environment in warm weather, escape and evacuation of wounded personnel, closed-hatch target acquisition, and development of tank crew measures of effectiveness (MOE).

In a buttoned-up tank, interior temperatures can be expected to degrade performance in warm weather.

Current training in escape and/or evacuation of injured or wounded personnel was extremely limited. If a tank is hit, the most vulnerable crew member is the gunner. Lifting straps built into a tanker's uniform would aid considerably in the evacuation of wounded or injured personnel.

Closed-hatch target acquisition performance was not affected significantly by either slew rate, cupola position, or the use of an aiming reference. Target acquisition performance was not degraded in the closed-hatch mode.

A literature survey on deriving MOE for tank crews revealed that techniques for deriving MOE for crews or larger personnel units were not well developed, except for gunnery. A program of research for developing tank crew MOE is outlined.

TR 78-A36. Haverland, E. M., & Maxey, J. L. (Human Resources Research Organization). Problems in helicopter gunnery. December 1978. (AD A064 274)

This research investigated how well helicopter crewmen could recognize and identify armored vehicles at standoff ranges. Scale-model armored vehicles were presented to observers at scaled ranges simulating full-scale ranges of 3,000 and 4,000 meters. In a preliminary experiment observers were trained using 7 x 50 binoculars to recognize as friendly or threat scale models of five different armored vehicles and to identify them according to type. Side, oblique, and front views of the vehicles were presented.

In the main experiment, the XM65 gunsight in an attack helicopter was used. Helicopter crewmen could recognize and identify the armored vehicles at scaled ranges of 3,000 and 4,000 meters. Pretraining increased both recognition and identification performance to almost 100%. Target view was found to be the only significant factor, with most errors occurring when the front view of the vehicles was presented. No significant differences were found in performance at 3,000 and 4,000 meter ranges, nor in performance for the five target vehicles.

TR 78-A37. Foskett, R. J., Baldwin, R. D., & Kubala, A. L. (Human Resources Research Organization). *The detection ranges of features of armored vehicles**. November 1978. (AD A068 043)*

To determine the range at which recognition features of armored vehicles can be detected, an experiment used reduced-scale techniques. Models of 20 armored vehicles were presented to observers who moved toward the targets from a maximum scaled distance of 4,000 meters to a minimum scaled distance of 100 meters. As the observers approached the scale models, they reported when detection of the various recognition features occurred. Findings indicated that recognition features stressed in training programs--number of road wheels and gun tubes, sprocket location, and number of rollers--were not seen until the observer was very close to the target. The only features seen at scaled distances of greater than 1,200 meters were tracks versus wheels, turret presence, and turret location. Rounded bowl-shaped turrets, such as used on Warsaw Pact vehicles, were recognized more easily than turrets of other shapes.

TR 78-A38. Kibler, A. W., Watson, S. R., & Kelly, C. W., III (Decisions and Designs, Incorporated); & Phelps, R. H. (ARI). *A prototype aid for evaluating alternative courses of action for tactical engagement**. November 1978. (AD A064 275)*

A decision-aiding technique was developed to assist division-level commanders and their staffs in choosing among alternative courses of action for tactical engagement. By employing principles of multi-attribute utility assessment methodology, a two-level model consisting of five general categories (terrain, own forces, enemy forces, weather, and risk) and 24 factors was developed and implemented on an IBM 5100 computer. In applying the decision aid, the user is required to score each of the alternative courses of action on each factor and to assign a weight indicating the importance of each factor in discriminating among the alternatives. A simple algorithm is used to calculate a weighted score for each course of action, the highest score being an indication of the preferred course of action. A sensitivity analysis provides a measure of the robustness of the scores and weights assigned by the user.

TR 78-A39. Dapra, R. A., & Byham, W. (Development Dimensions, International); & Rumsey, M. G., & Wellins, R. S. (ARI). *Development of the Instructor Orientation Course for the Army ROTC Management Simulation Program**. December 1978. (AD A069 667)*

This report describes the development and testing of an Instructor Orientation Course (IOC) to teach the Army ROTC Management Simulation Program (MSP). The IOC, a self-instruction program, was developed to enable MSP instructors to experience the program from a student perspective and to provide instructional models and/or skill practice relevant to critical instructor competencies.

Competencies identified during workshops attended by 30 prospective MSP instructors formed the basis of an IOC instructional system, which consisted of a videotape introducing the MSP, four audiotapes preparing instructors to teach the MSP, four workbooks developing the competencies required, and a training guide.

An evaluation of the IOC package by 14 MSP instructors showed it to be effective and useful. Deficiencies identified in the evaluation resulted in modifications to the IOC before it became fully operational.

TR 78-A40. Irving, G. W., Farrell, L. M., & Lindquist, G. (Integrated Sciences Corporation). Modeling of tactical events by interactive graphics: Approach, interface design, and system design. December 1978. (AD A064 324)

The development and implementation of a methodology for using interactive computer graphics to model combat events in tactical planning is discussed. The report outlines intelligence system concepts and identifies system concepts defined by man-machine functional allocation schemes. These concepts are evaluated as to predicted performance and associated technological risk. A functional flow breakdown of the selected concept is detailed. The algorithms and mathematical concepts used to implement the supporting models are described. A limited intelligence planning task is used to demonstrate the graphics modeling concept. Results of a qualitative evaluation are reported.

TR 78-A41. Campbell, R. C., Ford, J. P., & Campbell, C. H. (Human Resources Research Organization). Development of a workshop on construction and validation of Skill Qualification Tests. December 1978. (AD A066 782)

The purposes of this project were to convert the principles of the Handbook for the Development of Skill Qualification Tests (SQT) to a self-contained, self-instructional workshop for SQT developers; to try out the workshop at selected Test Development Agencies (TDA); and to revise workshop materials based on the tryouts.

The workshop had to be exportable, self-paced, and limited to 10 days; it was modeled on the principles of criterion-referenced instruction.

The nine tasks required in the construction and validation of SQT according to the Handbook were analyzed, and 34 subordinated skills within the tasks were identified. For each of the skills a module was prepared which contained explanation, examples, and activities; criterion tests and accompanying evaluation sheets were also prepared through which mastery of the individual skill was demonstrated.

The workshop materials were revised after a review and tryout, and a workshop utilizing the revised materials was conducted for 20 representatives of 13 selected TDA. After attending a course manager seminar, these persons acted as course managers at successive implementations of the workshop. At these workshops 213 participants from 22 TDA were trained; an end-of-course critique showed an overwhelmingly positive reaction.

TR 79-A1. Cook, J. R., & Herzer, I. (Ketron, Inc.). Development of scenario material to support two-person play within SIMTOS. January 1979. (AD A066 781)

The simulated tactical operations system (SIMTOS) was analyzed and modified to provide for interactive G3/G2 play (SIMTOS-23) and for a live aggressor G3 playing against a live defender G3 (SIMTOS-OD). Scenarios were developed for both SIMTOS-23 and SIMTOS-OD.

For SIMTOS-23, typical G2 functions and tasks were analyzed and player tasks selected. The G2 and G3 tasks were placed in a play sequence, allowing for individual and joint scoring. Existing G2 and G3 bulk data bases for defensive planning and the G3 bulk data base for combat were reviewed, and changes were recommended to satisfy SIMTOS-23 requirements. No significant change was required in the SIMTOS G3 defensive scenario, except that the G2 part of the current defensive G3 scenario should be replaced by the current defensive G2 scenario and data base.

For SIMTOS-OD an expert aggressor G3 (AG-3) should be engaged for the series of experiments. The AG-3 should be limited to one course of action in the planning phase and free play in the combat phase. Using a live AG-3 required modifications to the SIMTOS On-Line Facility and to the bulk and table data base; additional hardware subsystems were needed. The current DG-3 scoring methodology remained the same.

TR 79-A2. Marco, R. A., Bull, R. F., & Vidmar, R. L. (McDonnell Douglas Astronautics Company); & Shipley, B. D., Jr. (ARI). Rotary wing Proficiency-based Aviator Selection System (PASS). January 1979. (AD A069 838)

The Proficiency-based Aviator Selection System (PASS) was developed to improve quality selection of rotary wing aviator candidates and to reduce attrition. The PASS program objectives, learning sample selection, performance measurement methodology, and general criteria for predictive capability assessment are similar to those of the Automated Pilot Aptitude Measurement System (APAMS), but there are significant differences. In the PASS program, the instructions, flight maneuvers, and syllabus tasks from the APAMS learning sample were revised to utilize UH-1 Flight Simulators. New software programs were developed, and hardware components, such as an ML-1 VOTRAX voice synthesizer, were added. Results are reported of an operational demonstration of PASS in which 11 candidates for Rotary Wing Aviator Training (RWAT) and 11 instructor pilots participated.

TR 79-A3. Mays, P. V., & Holmgren, J. E. (ARI); & Shelnutt, J. B. (Litton-Mellonics). Current use, patterns of use and factors affecting use of the Army Training Extension Course (TEC) program. April 1969. (AD A075 380)

Use of the Training Extension Course (TEC) program was studied to determine the extent of its use, patterns of use, and factors affecting its use. TEC use was monitored for 2 months in 134 Active and Reserve Component battalions and 37 TRADOC activities within the continental United States (CONUS). Questionnaires regarding TEC use were completed by 3,404 soldiers and 608 unit trainers in 85 CONUS and U.S. Army, Europe (USAREUR) battalions. Interviews were conducted with 85 battalion, brigade, and division training personnel and seven associated Training and Support Centers (TASCs). Results showed a total of 78,742 uses of TEC, yielding an average TEC use per man per month of .353 lessons in the Active Component and .802 lessons in the Reserve Component. Most use occurred in groups during duty hours and was mandatory. Only 50.2% of the soldiers had used TEC, and 35.3% had never heard of TEC. Most respondents felt that TEC should be continued. TEC was preferred to four of seven other training methods. Reasons most often cited by soldiers for not using TEC were ignorance of TEC, unavailability of equipment, and lack of encouragement. Command emphasis on TEC was judged to be small to moderate. The authors conclude that the TEC program is underutilized relative to its potential because of ignorance of TEC, lack of command emphasis, and unavailability for voluntary individual use--the purpose for which it was designed.

TR 79-A4. Singer, R. N., Gerson, R. F., & Kim, K. W. (Florida State University). *Information processing capabilities in performers differing in levels of motor skill.* *January 1979. (AD A068 042)*

More proficient and less proficient performers of motor skills differ in many ways. Some factors explored in this report were differences in cognitive controls, learner strategies, and information processing. These factors were measured using an information-processing systems model framework, in which real and hypothesized mechanisms were identified as related to motor behavior. Many sources in the verbal learning literature and those pertinent in the motor learning literature were used to make inferences about differences between more skilled and less skilled individuals. The dissimilarities noted in strategy usage and processing capabilities serve as a base for techniques that might be used in instructional programs to benefit beginners and those having difficulty in attaining task mastery. Further work is needed in task classification schemes and individual difference analysis to determine more specific guidelines.

TR 79-A5. Isley, R. N., Miller, E. J., & Spears, W. D. (Seville Research Corporation). *Development of a course outline for training UH1FS instrument instructor pilots.* *March 1979. (AD A071 101)*

An outline was developed for a training course that could be used at field locations to prepare unit instructor pilots to use the UH-1H flight simulator (UH1FS) effectively in aviator training. The general approach was to employ, where applicable, the instructional systems development model described in the TRADOC pamphlet 350-30, Interservice Procedures for Instructional Systems Development. The instructor's job in using the UH1FS was analyzed in detail, and existing training materials were examined in terms of their use for the course under development.

Existing courses of instruction and existing training materials were found to be inadequate for training unit instrument instructor pilots in the effective use of the UH1FS. It would be feasible, however, to develop an exportable, self-contained, self-instructional, multimedia course of instruction in use of the UH1FS.

TR 79-A6. Fingerman, P. W., & Wheaton, G. R. (American Institutes for Research); & Boycan, G. G. (ARI). Simulation of a model tank gunnery test. March 1979. (AD A072 336)

This report describes the activities conducted during phase II of a project devoted to the development of methods for assessing tank crew marksmanship performance. An earlier report on phase I presented methods for the development of a criterion-referenced test of marksmanship. This effort led to the specification of a model livefire test of tank crew gunnery, together with scoring and test administration procedures for determining crew qualification. The present effort was aimed at evaluating the feasibility of assessing crew gunnery through the use of simulated, rather than live-fired, test exercises. Thirty-nine simulator devices were evaluated; two were identified as viable candidates for use in a simulated test. The analytic methodology is described, and a proposed simulated model test is presented. The report concludes with a discussion of the evaluation procedures that are required if the simulated model test is to be considered as a substitute for the livefire test.

TR 79-A7. Boldovici, J. A. (Human Resources Research Organization); Boycan, G. G. (ARI); & Fingerman, P. W., & Wheaton, G. R. (American Institutes for Research). M60A1AOS tank gunnery data handbook. March 1979. (AD A075 381)

The data base of the job objectives of M60A1AOS tank gunnery used in the development of a criterion-referenced test of tank crew marksmanship is presented. The history of the gunnery objectives and how they evolved is reviewed. The job objectives and their component behavioral elements are presented, together with a description of the computer programs used to analyze them.

TR 79-A8. Guion, R. M. (Bowling Green State University). Principles of work sample testing: I. A non-empirical taxonomy of test uses. April 1979. (AD A072 446)

This paper provides a background of the conceptual foundations of work sample testing, to determine whether different kinds of measurement, or different circumstances of measurement, have different implications for the development and evaluation of measurement procedures.

The unit of measurement in psychological research is typically the standard deviation of the distribution of a set of measurements, not a mathematically defined formal unit. The meaning of the score is defined relative to its position within the distribution of scores. Three recent challenges to classical psychometric theory seem to have special significance for work sample testing. These challenges are (a) a trend toward content-referenced measurement as distinguished from norm-referenced measurement, (b) latent trait theory, and (c) generalizability theory. To provide a framework within which to consider classical psychometric theory and these challenges, a tentative taxonomy of psychological measurement is proposed.

Six broad purposes of measurement are (a) evaluation of material, (b) organizational troubleshooting, (c) individual diagnosis, (d) individual proficiency, (e) prediction of future performance, and (f) evaluation of other measurements. Measurement is classified according to purpose, setting, variables, and methods of measurement.

Since work sample tests strive for objectivity, measurement must be accurate and interpretable in relation to a standard. Thus the more subjective combinations of variables and the methods for measuring them require research into the acceptability of possible inferences as the principal form of evaluation.

TR 79-A9. Guion, R. M. (Bowling Green State University). *Principles of work sample testing: II. Evaluation of personnel testing programs.* *April 1979. (AD A072 447)*

This paper, the second of four, offers suggestions for increasing the objectivity of measurement in programs of personnel testing and reviews classical concepts of reliability and validity. Construct validity is seen as the basic evaluation of a measuring instrument in psychology; criterion-related validity actually refers to hypotheses rather than to measurements, and content validity refers to test development. The major evaluation for personnel tests is less a matter of validity than of job relevance and of generalizability. Implications of latent trait theory and generalizability theory are discussed in terms of content-referenced testing for work samples.

TR 79-A10. Guion, R. M. (Bowling Green State University). *Principles of work sample testing: III. Construction and evaluation of work sample tests.* *April 1979. (AD A072 448)*

Work sample tests should be relevant to the job, objectively constructed and scored, reliable, and capable of being scored on a standardized content-referenced scale. Detailed steps in working from job analysis to establishing test specifications are presented for assuring job relevance. Methods are suggested for developing scales for scoring by a priori scaling, or by latent trait analysis, to provide a standard, content-referenced scale for scoring. Job samples should be evaluated primarily in terms of relevance and of generalizability.

Seven principles of work sample testing are offered to researchers: (a) choices of job content domains need justification; (b) test content domains should be as congruent as possible; (c) scoring procedures should strive toward fundamental measurement, emphasizing transitivity within a reasonably homogeneous domain; (d) scores should permit assessment of levels of proficiency rather than mere dichotomies; (e) opportunities for irrelevant influences on individual scores should be minimized; (f) scoring of work sample tests designed for use in large, multilocation organizations should be standardized on a content-referenced scale applicable to the organization as a whole; and (g) scores on a work sample test given in a setting of institutional control should generalize to a variety of field settings.

TR 79-A11. Guion, R. M., & Ironson, G. H. (Bowling Green State University). Principles of work sample testing: IV. Generalizability. April 1979. (AD A071 083)

Three kinds of generalizability are described: generalizability of test content, generalizability of relationships such as are described by validity coefficients, and generalizability of test scores across varying conditions. All are deemed important in constructing and evaluating work sample tests. A special problem is determining the limits of generalizability; it is suggested that the research designs of generalizability theory can be applied in some cases to determining the limits of the generalizability of criterion-related validities.

TR 79-A12. Ton, W. H., Hemingway, P. W., & Chastain, G. D. (Human Resources Research Organization). Further study of target handoff techniques. May 1979. (AD A077 850)

Problems in handing off targets between elements of Army Air are discussed in terms of the behaviors involved in the handoff task. Data obtained from verbal exchanges between individuals performing simulated handoffs were reanalyzed, and an improved handoff simulator was designed. The simulator also serves as a system test bed for evaluating procedures. The report describes the development of realistic stimuli for the simulation, which reflect the limiting assumptions guiding the research, and investigate the role of long-range target recognition on handoff performance. In addition, the effectiveness of simple unguided practice on handoff performance is evaluated. See also TR 78-A34.

TR 79-A13. Warnick, W. L., Chastain, G. D., & Ton, W. H. (Human Resources Research Organization). Long range target recognition and identification of camouflaged armored vehicles. May 1979. (AD A077 862)

The effects of armor camouflage on the ability of Attack Helicopter (AH) crewmen to recognize and identify armored vehicles were studied in two experiments. Using the COBRA/TOW weapons sight (XM65), AH crewmen viewed scale models of pattern-painted armored vehicles presented from five different angles. Each observer was pretested, trained, and posttested.

In the first experiment, the models were presented at scaled ranges of 3,000 and 4,000 meters against a uniformly green textured background. At both ranges crewmen could recognize and identify the vehicles. Pretraining identification scores averaged 62% and rose to 96% and 98.6% during the training and posttest phases.

In the second experiment, the models were presented on a terrain model at scaled ranges of 2,500 and 3,500 meters. At both ranges crewmen could recognize and identify the vehicles. Pretraining identification scores averaged 46.5% and rose to 79% and 90% during the training and posttest phases.

Of the five target views, the front view caused the most errors in recognition and identification. Also, the addition of camouflage patterns to the armored vehicle increased the number of learning trials needed to reach the learning criterion established in these studies. See also RR 1216, TR 78-A36, TR 78-A37, and TR 79-A17.

TR 79-A14. Kubala, A. L., & Warnick, W. L. (Human Resources Research Organization). A review of selected literature on stresses affecting soldiers in combat. May 1979. (AD A071 115)

Literature on stresses affecting soldiers in combat was reviewed to determine (a) the nature and extent of psychological and physiological stresses confronting a soldier on the battlefield, (b) the major factors influencing neuropsychiatric casualty rates, and (c) the degree to which performance is affected by various types of stress. The literature was categorized according to the history of the problem in the U.S. military, stress concepts, the extent of the stress problem, stresses affecting soldiers in combat, and effects of stress on performance.

Findings show that neuropsychiatric casualties were a major problem for U.S. forces in World War II, a small problem in Korea, and a comparatively minor problem in Vietnam. The combat soldier is confronted by multiple stressors--physical, psychological, chemical, biological, and radiological. Research on the performance effects of stress has been minimal, and inconsistencies in results are apparent; the work probably is not relevant to the combat situation. Wounding rates, cumulative time in combat, and frustrations resulting from a lack of purposeful activity have been associated with increases in combat exhaustion rates.

TR 79-A15. Kubala, A. L. (Human Resources Research Organization). Final report: Human factors research in military organizations and systems. May 1979. (AD A077 339)

This report summarizes the principal findings of seven research projects at the ARI Fort Hood Field Unit on target handoff techniques, tank crew measures of effectiveness (MOE), fatigue effects of CAV NAV goggle use, long-range target recognition, effects of combat stress on performance, symbology for automated graphic displays, and suppression research. A supplement to the general target handoff report describes techniques for preparing handoff simulation imagery (TR 79-A17).

Intensive target handoff practice under simulated conditions is effective in improving performance in target acquisition but not in target handoff (TR 79-A12). A comprehensive evaluation of tank crew performance is seen to be beyond the capabilities of most units, regardless of the evaluation strategy chosen. Although night vision goggles (NVG) are well accepted, users experienced fatigue and discomfort and showed decrements in response behavior to errors; redesigning the helmet was found to enhance comfort (TR 79-A16). No differences were found in either recognition or identification due to range when the vehicles were presented on either a uniform or a terrain background (TR 79-A13). A review of the literature on stress showed little relationship to the role of the soldier in combat (TR 79-A14). Naive subjects were found to prefer pictorial tactical display symbols to traditional military alternatives (TR 79-A18). Kinetic energy appears to be highly related to acoustic signatures and a subjective measure of suppression; further research to validate this finding is needed, and the relationship between other physical variables and suppression should be explored (TR 79-A19).

TR 79-A16. Chastain, G. D., Ton, W. H., & Kubala, A. L. (Human Resources Research Organization). Fatigue effects from wearing the AN/PVS-5 night vision goggles. May 1979. (AD A077 519)

Problems of discomfort and fatigue related to extended use of AN/PVS-5 night vision goggles (NVG) were investigated in three studies. In the first study 21 aviators and six motorcycle scouts returning from night maneuvers involving lengthy NVG use completed a questionnaire relating to the usefulness of the NVG, the nature of physiological discomforts experienced, and the ease of NVG positioning. The NVG was preferred to the naked eye for night maneuvers and tasks, but most users reported not only discomfort and fatigue problems but also positioning difficulties due primarily to the interface of the NVG with the SPH-4 helmet. In the second study 34 aviators, tested before and after flights in which there was lengthy NVG use, were found to experience eye-hand coordination decrements, lack of corrective behavior in response to errors, and evidence of prolonged physical exertion.

In the third study 30 aviators performed head-turning exercises wearing modifications to the helmet-goggle configuration suggested by users; the aviators then rated each configuration. Raising the brow of the SPH-4 helmet and adding a chincup or helmet counterweight were rated favorably. See also RR 1217.

TR 79-A17. Foskett, R. J., & Ton, W. H. (Human Resources Research Organization). Development of a photo montage technique for simulation of tactical situations. May 1979. (AD A079 032)

A technique was developed for preparing photographic imagery of combat vehicles in tactical situations. Slide photos (35mm) of terrain were taken from a helicopter flying at realistic nap-of-the-earth (NOE) altitudes. They were then projected onto a white screen, and black-and-white cutout photos of scale-model combat vehicles were attached to the screen. The resulting image was then re-photographed to produce a montage of vehicles emplaced in terrain. Intended for use in the handoff simulator and the recognition training slide kit, the resulting transparencies were judged to be realistic and superior to those obtained with models on a terrain board.

TR 79-A18. Hemingway, P. W., Kubala, A. L., & Chastain, G. D. (Human Resources Research Organization). *__Study of symbology for automated graphic displays__. May 1979. (AD A076 916)*

This research studied the preferences of civilian subjects in assigning symbols to represent military units displayed by the Command and Control Interactive Display Experimentation System (CCIDES). Twelve male and 13 female participants ranked 24 battlefield symbols from Field Manual (FM) 21-30 with alternative Soviet symbols and geometric and pictorial forms according to how meaningfully each symbol represented a particular designation. Pictorial symbols were found to be most meaningful and Soviet symbols least meaningful. No significant difference was found between the geometric and U.S. symbols, which were ranked between the pictorial and Soviet symbols. Sex of the participant was not found to be a factor in determining differences in rankings.

TR 79-A19. Kubala, A. L., & Warnick, W. L. (Human Resources Research Organization). *__A further look at the prediction of weapons effectiveness in suppressive fire__. May 1979. (AD A071 116)*

The relationship between acoustic signatures of small-arms projectiles and the suppressive behavior resulting from soldiers' perceptions of danger was analyzed, based on a review of the literature. Data on the acoustic signatures of projectiles down range from the weapon were found to be limited and of little value in determining the relationship between signatures and the psychologically derived Suppression Index and perceived dangerousness ratings. Kinetic energy associated with perceived loudness of passing projectiles is thought to be the primary physical property of projectiles that affects behavior under fire.

Further research is recommended to validate the findings relative to kinetic energy and to refine the mathematical relationship between miss distance, rate of fire, and psychological scales such as the Suppression Index.

TR 79-A20. Badre, A. N. (Georgia Institute of Technology). *__Selecting and representing information structures for battlefield decision systems__. June 1979. (AD A071 117)*

Experimental techniques were applied to identify and evaluate the patterns of information that are meaningful to tactical users in analyzing battlefield map positions. The study utilized "chunking" theory, which proposes that problem solvers process information from a problem scenario in terms of well-formed structures and chunks.

Participants were 12 military officers ("experts") and 12 university students ("novices") who were shown slides of 12 battlefield maps. Three of the maps were realistic, three were plausible but not likely to occur, three were not possible on a real battlefield, and the last three reproduced the first three maps with unit designators added. Each participant was asked to reconstruct the battlefield on a diagram sheet after viewing each slide under two time conditions, 10 seconds and 1 minute. Each person also completed a copying task. Symbol placement times and order of symbol placements were analyzed according to accuracy of recall, chunking frequency, chunk size, chunk content, and the relationship of processing speed to the coherence of the chunk.

Results showed that tactically meaningful relations are the basic elements of an expert's informational chunk, but novices also chunk information by relating symbols in meaningful ways. A direct relationship was found between the relational density of a chunk and the speed with which the information was processed. Chunk size in terms of relations was related to battlefield expertise, but no such relationship was found for chunking frequency, which was more directly related to time given for studying the battlefield map, regardless of expertise.

TR 79-A21. Root, R. T., Hayes, J. F., & Word, L. E. (ARI); & Shriver, E. L., & Griffin, G. R. (Kinton, Inc.). Field test of techniques for tactical training of junior leaders in infantry units. July 1979. (AD A075 604)

Infantry company performance in an engagement simulation field tryout was the means of comparing the effectiveness of the experimental Effective and Efficient Leader Training (EFFTRAIN) with conventional training. The EFFTRAIN package consisted of a board game, a Tactical Opposition Exercise (TOX), a free-play Field Opposition Exercise (FOX) for cadre only, and infantry REALTRAIN exercises. It was used to train an infantry company for 4 weeks, after which the company competed in REALTRAIN exercises with a control company that had conducted conventional training of its own choice for the same period. EFFTRAIN units won five of six REALTRAIN exercises, with the sixth considered a draw. It was concluded that EFFTRAIN training is more effective than conventional training.

The relative value of data collected during an exercise and data collected at its conclusion is discussed. Supplementing written documentation of EFFTRAIN training procedures with oral instructions is recommended.

TR 79-A22. Shaket, E., Ben-Bassat, M., Madni, A., & Leal, A. (Perceptronics). Applications of adaptive programming technology (APT) to command group training and performance improvement. May 1979. (AD A076 234)

This research analyzed the feasibility of applying adaptive programming technology (APT) to improve military command group performance. APT is considered to have the highest payoff as a decision aid for a division-level G2 who performs situation assessment. Unlike conventional data base systems, APT is designed to handle a moderate amount of data organized into many highly interdependent relations, compatible with human conceptualization. Requirements for a situation assessment system were analyzed, and a specific system structure to meet these requirements is described. An estimated 5 years of development would be necessary to transfer the APT technology into the military environment. A 5-year plan is presented which provides yearly demonstrable subsystems and which culminates in a comprehensive, minicomputer-based, stand-alone, decision-aiding system.

TR 79-A23. Havron, M. D., McFarling, L. H., & Hill, H. (Human Sciences Research, Inc.); & Wanschura, R. G. (ARI). Improved ARTEP methods for unit evaluation. Volume V: Analysis of alternative training settings. April 1979. (AD A075 465)

This report is the fifth volume of a study on improved Army Training and Evaluation Program methods for unit evaluation. The fourth volume has been provided to the Army as ARI Research Product 79-7, Improved ARTEP Methods for Unit Evaluation: Guidance for Planning and Conduct of Company-Level Field Exercises, by M. D. Havron, T. J. McCullough, and L. H. McFarling (Human Sciences Research, Inc.), and R. G. Wanschura (ARI), April 1979. (AD A075 470) The report compares the relative merits of nine settings for conducting the training of tactical units and their leaders. Settings selected for study were the Field Training Exercise (FTX), the Field Training Exercise with Engagement Simulation (FTX/ES), the Tactical Exercise Without Troops (TEWT), the Command Post Exercises (CPX), the Combined Arms Tactical Training Simulator (CATTS), the Computer-Assisted Map Maneuver System (CAMMS), Pegasus, Dunn-Kempf, and the Small Combat Unit Evaluation Game (SCUE).

Settings are described in detail on 35 parameters which relate to the training setting framework, functions and duties of players, requirements for administration, and measurement, evaluation, and feedback. Training settings are compared and contrasted. Considerations for combining and sequencing training settings in battalion training programs are explained, and example sequences are presented. Features common to the effective use of any training setting are discussed.

TR 79-A24. Havron, M. D., & McFarling, L. H. (Human Sciences Research, Inc.); & Wanschura, R. G. (ARI). Improved ARTEP methods for unit evaluation. Volume VI: Conventional ARTEP missions and engagement simulations: An examination of options. April 1979. (AD A075 663)

This is the sixth report in a study on improved Army Training and Evaluation Program (ARTEP) methods for unit evaluation. It examines the options offered in conventional ARTEP missions and engagement simulations (ES). Conventional methods of unit evaluation are compared with ES according to scenario construction and exercise structure, task content and performance, observation and control of performance, evaluation of performance, data reduction and interpretation, and evaluation feedback delivery and use. Advantages and limitations of training and evaluation outlines (T&EO) are compared with those of ES. ES is seen not merely as an adjunct to the conventional method that uses T&EOs as a guide: conventional methods must be built around the ES frame and format. An examination is made of the issues within an integrated system, such as functions required of controller/evaluators for performance observation and evaluation and to make ES work. Data reduction and integration are also discussed, together with feedback and use of results.

TR 79-A25. Havron, M. D. (Human Sciences Research, Inc.); & Wanschura, R. G. (ARI). *Improved ARTEP methods for unit evaluation: Volume VII: Executive summary*. *April 1979. (AD A076 957)*

This report, the last of seven volumes on improved Army Training and Evaluation Program (ARTEP) methods for unit evaluation of tank/mechanized infantry units, is an executive summary of the preceding studies. Volume I, TR 78-A26, identified relevant issues and problems by observation of battalion field exercises and discussions with military sources. Literature on learning theory, systems analysis, and psychometric methods was reviewed. Recommended solutions came from both the scientific literature and military sources. Volume II, TR 78-A27, proposed broad concepts and principles to help training managers and evaluators understand reasons for the specific guidance provided and to help training managers formulate procedures not covered by specific guidance. Volume III, TR 78-A28, presented initial guidance for exercise planners and evaluator/controller teams. However, its use is not recommended because it did not provide for fire support coordination with artillery and air operations in battalion staff operations.

Volume IV translated the previous effort into practical guidance for company and platoon-level evaluations (ARI Research Product 79-7). It includes a rationale, a planning guide for battalion-level commanders and training managers, a program of instruction for evaluator/controller training, and an annex for division, brigade, and battalion levels. Volume V, TR 79-A23, described nine training settings in terms of setting, scenario, and method of task presentation to players; player tasks and how they were conducted; requirements for administration; and provision for measurement of performance, diagnosis, and correction of deficiencies. Battle simulation settings were considered superior to field exercise settings for training staff personnel and troop leaders. Volume VI, TR 79-A24, explores the issues and options involved in incorporating engagement simulation into the ARTEP concept.

(B Series)

TR 78-B11. Smith, K. H. *Evaluation of leadership at the Fort Benning Assessment Center*. *November 1978. (AD A077 999)*

The Fort Benning Assessment Center operated from July 1973 to December 1974 as a demonstration and pilot project, with two major purposes: (a) to determine the validity of an assessment center for predicting performance in Officer Candidate School and junior officer assignments, and (b) to test the value of assessment and counseling for personal and career development. Assessees took 3½ days of paper-and-pencil tests, interviews, and eight individual and group exercises, just prior to entering their assigned formal school training. Data were collected for 143 Branch Immaterial Officer Candidate Course (BIOCC) candidates, 96 newly commissioned second lieutenants entering the Infantry Officer Basic Course (IOBC), 88 captains entering the Infantry Officer Advanced Course (IOAC), and 87 NCOs entering the Advanced Noncommissioned Officer Educational System (ANCOES). The captains and NCOs returned for feedback and counseling two weeks later.

Analysis of the data indicated adequate reliability for the observational ratings, in some cases quite high. Factor analysis of the overall performance of the BIOCC candidates disclosed a dimensional structure of 21 separate behavioral dimensions actually measured. The originally identified dimensions of communication skill, forcefulness, social skills, and application of mental ability appear to be measured better by assessment center methods than by any other process.

Follow-up studies on the school and career performance of the assessees are continuing to establish the validity of the data (see Technical Paper 372).

TR 78-B14. Fiman, B. G. (Human Sciences Research, Inc.). An analysis of the training of Army personnel at the Defense Race Relations Institute. October 1978. (AD A078 001)

As part of a 1976 study of Army race relations (RR) and equal opportunity (EO) training, this research analyzed the training received by Army personnel at the Defense Race Relations Institute (DRRI) in terms of its impact on the trainees and its relationship to job performance of DRRI graduates in the field.

Data were obtained by interviews with and questionnaires from DRRI faculty, students, and graduates; RR/EO field personnel; and unit commanders and personnel during April-December 1976.

Almost without exception, DRRI graduates reported that the school experience had a powerful and meaningful impact on them. RR/EO personnel in the field felt the content of training was not effectively aligned with their needs. Existing selection criteria appeared unrelated to performance at DRRI or on the job. The report suggests several courses of action to increase training effectiveness and usefulness.

TR 78-B15. Edmonds, W. S., & Nordlie, P. G. (Human Sciences Research, Inc.). Analysis of individual race relations and equal opportunity training in Army schools. October 1978. (AD A078 002)

This report describes and analyzes the individual race relations and equal opportunity (RR/EO) training given in Army Training Centers and service and professional schools in 1976, as part of an analysis of all RR/EO training and education being given in the Army at that time.

Staff and faculty were interviewed at two selected training centers, four service schools, and three senior colleges; lesson plans and training documents were reviewed; and a questionnaire survey of students currently enrolled elicited their attitudes toward and perceptions of RR/EO training.

Faculty and staff tended to agree that RR/EO training was important but had lower priority than MOS-related training. Consistent differences by race and level of awareness training were found in students' perceptions of the RR/EO training. Nonwhites generally perceived the training as more useful and appropriate than did whites. Personnel attending the leader courses perceived it far less positively than did the Basic Combat Trainees, who said they thought the training was appropriate and would help them to solve problems.

TR 78-B16. Wallis, M. R. (Richard A. Gibboney Associates, Inc.). The application of duty modules to the front-end analysis of the Command and General Staff College regular course. December 1978. (AD A075 425)

The research tested the hypothesis that duty modules are useful tools for a front-end analysis of the Command and General Staff College (C&GSC) regular course curriculum. Subjects were 20 high-level staff officers representing eight branches and 19 Officer Personnel Management System (OPMS) specialties in the grades of major through colonel who performed in 17 catalogued duty modules. The officers were surveyed to determine the validity of a newly constructed duty module of high-level staff functions and the catalogued duty modules.

A comparison of the new duty module for high-level staff officers with the objectives of the "High-Level Staff Application" course showed that the course does prepare students to perform the officer duties associated with high-level staff positions.

A consideration of the duty module pertaining to a commander's tactical duties in actual or simulated combat situations--the only duty module addressed in the "Battle Captains" elective course for command designees--showed that the module fits perfectly the program of instruction.

TR 79-B1. Elliott, T. K., & Joyce, R. P. (Applied Science Associates, Inc.); & McMullen, R. L. (ARI). The causes of attrition in Initial Entry Rotary Wing training. January 1979. (AD A075 468)

To study the causes of attrition in Initial Entry Rotary Wing (IERW) training, all setbacks and eliminations in a 2-year period were analyzed by cause frequency and by course segment. These data were subdivided for officers and warrant officers and by pre- and post-Warrant Officer Candidate Military Development.

Interviews with participants and school personnel were conducted, aviation candidate selection literature reviewed, school records examined, and a questionnaire developed to see if historical or self-descriptive student characteristics were predictive of difficulty with IERW.

Results showed deficiencies in selection procedures for IERW, excessively vague criteria for elimination from IERW, and a current curriculum with little effect on attrition. Some generalizations for predictive identification of attritees and nonattritees are presented.

TR 79-B2. Graham, W. R., Brown, G. H., King, W. L., White, L., & Wood, M. D. (Human Resources Research Organization). A pilot study of Army recruiters: Their job behaviors and personal characteristics. March 1979. (AD A075 430)

Structured interviews were conducted with 79 Army recruiters to obtain information on the nature of recruiting duty as a basis for developing hypotheses on the personal characteristics and job behaviors associated with recruiter success.

Illustrative findings show that high producers (a) were less likely than low producers to cite "independence" as a source of job satisfaction, (b) tended to complain more about their long hours of work, (c) mentioned less often that they had trouble communicating effectively, and (d) described themselves less often as "empathetic." Responses describing "successful" and "unsuccessful" recruiters appeared to reflect only stereotypical notions. Prospecting and selling techniques are described, and recruiters' opinions on training and selection are reported.

TR 79-B3. Bonner, B. (General Research Corporation). *A survey of USAREUR entry level skills of the 11B infantryman. May 1979. (AD A078 498)*

Combat arms skill retention of 109 recent Advanced Individual Training (AIT) graduates newly assigned to U.S. Army, Europe (USAREUR) infantry units was examined by four methods of skill assessment. The soldiers were administered written self-assessment and skill qualification tests and a hands-on skill qualification test; randomly selected squad and platoon leaders were asked to assess the soldiers' deficiencies and comment on aspects of training.

Most of the soldiers remembered being trained and tested on 50 of the 54 individual tasks trained in the Basic Combat Training (BCT)/AIT training cycle, although for some tasks as few as 10% remembered the training. Results of the four skill assessment methods varied, but all showed that the 11B soldier could not perform to standard all tasks on which he was trained to standard, especially tasks requiring information retention. Both soldiers and supervisors overestimated the soldiers' skill levels. Supervisors expected soldiers to perform to standard, were not aware of skill retention problems, and underestimated the difficulty of retraining Military Occupational Specialty (MOS) skills.

The findings suggest that skill retention must be reinforced by increased refresher training and by repeated testing. Better communication with supervisors and reexamination of BCT/AIT training goals are recommended.

TR 79-B4. Bialek, H. M., & Brennan, M. (Human Resources Research Organization). Development and implementation of a performance based training and evaluation system for the combat arms. May 1979. (AD A075 431)

This report summarizes a project to develop and implement the Individual Extension Training System (IETS), an individual skill training system for infantry units. Following a review of IETS characteristics, structure, functions, and sample materials, the report describes the content, administration, and outcomes of a series of workshops given to trainers and training managers. First-hand observations and interviews and analysis and discussion of implementation problems are used to evaluate the system.

TR 78-TH3. Negroponte, N., Herot, C., & Weinzapfel, G. (Massachusetts Institute of Technology). One-point touch input of vector information for computer displays. October 1978. (AD A064 278)

When the finger is used as a graphical stylus on a cathode ray tube (CRT), it has a coefficient of friction with glass sufficient to provide input of direction and torque as well as position from a single point. This report describes a pressure-sensitive digitizer (PSD) capable of accepting these force inputs, and discusses a set of five simple input applications used to assess the capabilities of this device. The applications include techniques for specifying vectors, and pushing, pulling, dispersing, and reorienting objects with a single touch. Experience gained from these applications demonstrates that touch and pressure sensing show potential for immediate and multidimensional interaction.

TR 78-TH4. Cohen, A. S. (Swiss Federal Institute of Technology). Eye movements behavior while driving a car: A review. October 1978. (AD A061 271)

This report presents empirical data on the driver's eye movement behavior and illustrates the conditions under which an investigation of the driver's rational information input is appropriate.

The report reviews empirical investigations on automobile drivers' eye movement behavior while driving on straight roads, curves, through traffic, and familiar driving routes. Human factors such as driving experience, physical condition, and the effects of alcohol, fatigue, lack of sleep, and carbon monoxide are treated along with characteristics of the automobile.

The results suggest that even though the fixations and the movements of the eye represent only a peripheral criteria for information input, they do refer to central processing mechanisms. The eyes, presumably, follow only the requirements of the brain for adequate information input in relationship with the environmental conditions.

TR 78-TH5. Cohen, A. S. (Swiss Federal Institute of Technology). Car drivers' pattern of eye fixations on the road and in the laboratory. October 1978. (AD A069 755)

Drivers' eye fixations were registered during actual driving on the road and in the laboratory while viewing a slide of the same traffic situation. The participants in the second group were told to observe the slide as if they were driving, but they fixated their eyes on well-defined targets with different frequencies than did participants who actually drove on the road. Also, participants in the laboratory showed a tendency toward prolonged fixation times compared with those in the road driving condition. The results suggest that the participants driving on the road fixated on more task-oriented targets and also picked up more information than did their counterparts in the laboratory.

TR 78-TH6. Levy-Leboyer, C., & Voisin-Vedrenne, B. (Rene Descartes University, Paris). Managerial and organizational determinants of efficiency in research teams. October 1978. (AD A064 277)

This report describes an effort to (a) list and define organizational variables between a leader and the quality of research, and (b) evaluate the work (pharmaceutical research) in terms of individual traits, relationship of traits to each other, situational variables, self and management ratings, and relationships between performance, job satisfaction, and prestige of the laboratory.

Four areas of pharmaceutical research were studied: a Paris university (School of Pharmacy of Paris V), a Paris suburban university, public agencies, and private firms. Two questionnaires were distributed to 126 researchers, and data from 98 were used to determine the results.

Results indicated that quality of research among the samples of French pharmacy teams was a function of organization characteristics, leadership behavior, job satisfaction, worker attitude, and social climate. Organizational determinants of research success seemed to involve favorable personality traits and good adaptation to the research environment.

TR 78-TH7. Bonnet, D. G., & Snyder, H. L. (Virginia Polytechnic Institute and State University). Prediction of the recognition of real objects as a function of photometric and geometric characteristics. December 1978. (AD A071 118)

A field-amenable technique can predict air-to-ground tactical target-by-target acquisition performance. Microdensitometric scans were made from air-to-ground reconnaissance films containing 12 tactical targets. Data from these scans were used to derive 36 photometric and geometric variables, which were employed in a stepwise linear multiple regression analysis to predict air-to-ground target acquisition performance. The 36 predictors were reduced to 17 by a consistency criterion, with the resulting 17 variables used to generate a linear model which predicted range to target at the time of acquisition. The prediction model was evaluated for accuracy with both one and two different images of the same target, and for single and multiple microdensitometric scans through the target in each image.

The findings showed that the ground range at which a given target will be detected by an airborne observer may be predicted entirely automatically, given reconnaissance imagery, a microdensitometer, and a small computer.

TR 78-TH8. Bloomfield, J. R., Beckwith, W. E., Emerick, J., Marmurek, H. H., Tei, B. E., & Traub, B. H. (Ohio State University Research Foundation). Visual search with embedded targets. December 1978. (AD A069 666)

This investigation of embedded target search situations explored relationships between measures of visual search performance, peripheral visual acuity, and ratings of discriminability obtained with embedded targets; it also compared competition and embedded target search tasks.

In two experiments, search times were recorded for color and black-and-white textured targets; in four experiments, which created competition search tasks, search times were recorded for different size targets and for color targets. Peripheral visual acuity was measured for the color embedded display, the color separated displays, and the black-and-white embedded display. Analysis showed that when complex textured backgrounds are used, simple relationships exist between visual search time, peripheral visual acuity, and rated discriminability.

TR 78-TH9. Singer, R. N., Gerson, R. F., & Ridsdale, S. (Florida State University). A conceptual orientation to the study of motor behavior. December 1978. (AD A064 279)

A global model was developed with special emphasis on cognitive (control) processes that may operate in the learning and performing of complex motor behaviors. It is most meaningful for instructional and self-learning purposes to determine which processes may be under the control of the learner and which strategies are available for the learner to select from. The intent of this work was to facilitate the acquisition of skill and to encourage learners to use self-managed rather than externally induced strategies to achieve goals with categories of psychomotor tasks. Experimental work and an analysis of cognitive and psychomotor literature should identify the best alternative learner strategies to maximize the internal operations that contribute to effective motor behavior.

TR 78-TH10. Singer, R. N., & Gerson, R. F. (Florida State University). Cognitive processes and learner strategies in the acquisition of motor skills. December 1978. (AD A064 335)

The cognitive processes and learner strategies associated with motor skill acquisition, retention, and transfer are identified and defined in relation to processing mechanisms. Methods that trainees may use to deploy strategies in a variety of skill situations are also described. Further, a preliminary task classification scheme is proposed as it relates to a conceptual model of motor behavior. The classification scheme will facilitate the enumeration of learner strategies and their relation to categories of motor tasks that, in turn, will improve task analysis and instructional procedures. Several experiments are being conducted to test the effects of learner strategies on motor behavior.

(P Series)

TR P-78-3. Butler, A. K., Bennik, F. D., Benesch, M. A., & Silver, L. A. (System Development Corporation). TEC media alternatives for the FY 78-83 period: Procedure guide for delivery systems selection. November 1978. (AD A068 045)

A wide range of methods and media are available or potentially available for delivering current Army Training Extension Course (TEC) systems at unit levels for individual and collective training.

To help Army training developers choose delivery systems for a variety of training requirements, three interrelated user products were designed, developed, and documented. The first is this Procedure Guide, designed to aid the developer in deciding on, selecting, or developing the best mix of Army delivery systems both for an overall training program and for each of its lesson modules.

Complementing this volume is the Delivery Systems Data Base, P-78-4, an expandable document that indexes the pertinent characteristics of 42 Army delivery systems. P-78-5, MOS 13F/FIST Sample Application, illustrates the combined use of the first two volumes as applied to training for the TACFIRE Support Specialist. ARI Technical Report TR 78-A30 provides an overview of the entire project, describing the developmental work and each of the three user products.

TR P-78-4. Silver, L. A., Bennik, F. D., Butler, A. K., & Benesch, M. A. (System Development Corporation). TEC media alternatives for the FY 78-83 period: Delivery systems data base. December 1978. (AD A069 882)

To help Army training developers choose delivery systems for a variety of training requirements, three interrelated user products were designed, developed, and documented. The first is a Procedure Guide for Delivery Systems Selection, published as ARI P-78-3, to help developers select the best mix of systems for overall training programs and for lesson modules. This document is the second in the series and may be used in conjunction with the first or alone for reference. The third document, MOS 13F/FIST Sample Application (ARI P-78-5), illustrates the combined use of the first two volumes as applied to training for the Fire Support Specialist.

This data base contains information on a wide range of Army delivery systems currently or potentially available to the Army Field Artillery School. It indexes the pertinent characteristics of 42 Army delivery systems grouped into 12 "families"--job materials, printed materials, training/combat literature, instructor with standard aids, audio-only, audiovisual, television/video recording, computer-assisted/managed instruction, embedded training, training devices/simulators, and command/staff battle simulations.

TR P-78-5. Benesch, M. A., Bennik, F. D., Butler, A. K., & Silver, L. A. (System Development Corporation). TEC media alternatives for the FY 78-83 period: MOS 13F/FIST sample application. October 1978. (AD A068 047)

This document is the third of a set designed to help Army training developers choose delivery systems for a variety of training requirements.

The first is a Procedure Guide for Delivery Systems Selection (ARI P-78-3) that will help developers select the best mix of systems for overall training programs and for lesson modules. The second volume, the Delivery Systems Data Base (ARI P-78-4), indexes the pertinent characteristics of 42 Army delivery systems. This document illustrates the application of the first two volumes to a particular Army Field Artillery School training support requirement--the cross-training of soldiers for proficiency in Fire

Support Specialist individual and collective tasks required by duty positions on the Fire Support Team of a tank company.

ARI Technical Report TR 78-A30 provides an overview of the entire project.

TR P-79-1. Atwood, M. E., & Ramsey, H. R. Annotated bibliography on human factors in software development. June 1979. (AD A071 113)

As part of a larger ARI effort to survey, synthesize, and evaluate the state of the art in the human factors area applied to software development, an extensive literature survey was conducted. The resulting bibliography contains citations of 478 articles or reports pertaining to the behavioral aspects of software design, programming, coding, debugging, testing, evaluation, and maintenance. Most citations are accompanied by descriptive abstracts, and all are indexed by author, publication source, institutional affiliation, and subject. To help the user unfamiliar with the area, the volume contains brief, basic reference lists in the areas of software engineering, the psychology of software development, the Structured Programming Series, and the DOD software program. Coverage is exhaustive through 1977, with a few references in 1978.

Research Notes

RN 79-1. Wallis, M. R., Davis, W. P., & Korotkin, A. L. (Richard A. Gibboney Associates, Inc.). Duty module validation for accomplishing training feedback. Volume I. System design for training feedback. November 1977. (AD A066 243)

The purpose of this research was to develop a mechanism for providing objective feedback from the field regarding the adequacy of training in Army Service Schools. Existing duty modules were used as the basic job element for developing Performance Certification Components (PCCs) to measure an officer's performance capability.

The Armor School was selected for the development and field verification of data elements for eventual use in a prototype training information feedback system.

Armor company/troop commanders and platoon leaders who had graduated recently from the Advanced and Basic officer courses and who are currently assigned to units at Fort Hood, Tex., were selected to comprise a survey sample to determine the adequacy of their preparation to perform in their duty positions.

PCCs, like duty modules, seem to apply in various combinations to officer duty positions without regard to duty position. Thus it may be appropriate to evaluate grade and branch qualification with SQTs and to evaluate duty position qualification with PCCs.

RN 79-2. Hadley, H. I., Davis, W. P., & Korotkin, A. L. *Duty module validation for accomplishing training feedback. Volume II. The relationships among CODAP tasks, Skill Qualification Test tasks, and duty module tasks.* *November 1977. (AD A066 244)*

This report contains Qualification Test tasks and their utility for providing training information feedback.

The size of a job task varies considerably depending on what the job data are to be used for and the level of the job the task data are defining. Job tasks that are to be used for personnel classification and assignment must be fairly broad in scope, while those to be used to design an occupational training course for a piece of new equipment must be more detailed. Those that are describing a field grade officer position can be comprehensive in size, while those describing a junior grade enlisted job must, by the nature of the work, be narrow and specific.

This report is based on the interrelationship among tasks of differing scope, as used in different programs, and their value in providing training information feedback. Three sets of tasks were used, all describing job classification MOS 11E, Armor Crewman, but drawn from different programs. In all three cases the MOS described was 11E, Armor Crewman, comprising four different skill levels and covering grades E-1 through E-8. The programs from which the task data were drawn were the Department of Army program of enlisted Skill Qualification Tests, the Military Personnel Center's CODAP program of inventorying enlisted jobs on a cyclic basis, and the ARI program of developing duty modules for officer and enlisted jobs.

RN 79-3. Hart, F. L., Jones, D. R., & Smith, M. G. (Kinton, Inc.). *Development of field methodology and processes.* *October 1978. (AD A066 242)*

This report describes development of a Training Feedback Management Information System. The system objectives were to provide information usable to multiple levels of command, including schools.

The research produced provides a unit of reporting that can be unpacked for use by different levels of command and by the schools. It also provides an index of the effect on unit effectiveness of failure to perform the tasks to standard.

The system was based on a study of the Maintenance Control Section and Automotive Section of two Direct Support companies. It was implemented in one of the units studied. The unit welcomed this system as a means of keeping accurate accounts of their operation--essentially allowing them to meet doctrinal objectives.

This research reports initial work in the area of maintenance performance research and is useful as a resource document. A complete report will be published in 1981.

RN 79-4. Bosley, J. J., Onoszko, P. W. J., & Sevilla, E. R., Jr. (Human Sciences Research, Inc.). *The role of the After Action Review leader in REALTRAIN: Research on training needs. January 1979. (AD A066 717).*

A critical component of the tactical engagement simulation (ES) training method is the After Action Review (AAR), in which events that occurred during the ES exercise are reviewed chronologically.

This report describes a nonexperimental approach to studying the role of the AAR leaders in tactical ES training. Using observational data, the research team was able to identify a consensually validated list of critical skills.

Knowledges and skills required by AAR leaders were classified in four knowledge/skill areas. Skill in preparation for the AAR during the simulated battle is typically reflected in the organization and effective conduct of the AAR.

An important skill needed to hold AARs is that of creating and maintaining a sanction-free atmosphere throughout the discussion. ES makes it both possible and necessary for the AAR leader to do this. Assessed casualties and the actions of those who inflicted and suffered casualties are the objective data about which the AAR is built. Given this information, the AAR leader focuses attention on casualties. His role is to draw reasons for casualties from participants. Many AAR leaders, accustomed to the role of critic/evaluator, find it difficult to assume this more permissive role. As a result, troops (who know what casualties they inflicted/suffered) are inclined either to argue with the leader or to "clam up." Thus, the learning benefit associated with active and free participation is not realized. In training Army leaders to conduct AARs, it must be stressed that leaders must conduct AARs in an open noncritical manner, letting the soldiers and the leaders develop guides for effective behavior based on casualties.

RN 79-5. Frederickson, E. W., & Freer, D. R. (Applied Science Associates, Inc.). Basic electronics skills and knowledges. December 1978. (AD A068 191)

An analytical process for deriving skills and knowledges for an electronic maintenance MOS was developed. The process model assumes that the MOS is well documented. The process first identified all tasks performed on specifically designated equipment groups (end items) using a Task Identification Matrix (TIM). One-fourth of the tasks performed on each item were selected, using various criteria, for detailed task element analysis. The task elements are validated prior to the detailed analysis. The purpose of the analysis is to identify behaviors and knowledges not possessed by the general population. The product of the analysis is an extensive list of behavior/information statements that are used to construct a maintenance fundamentals job description questionnaire. This is administered to a representative sample of job incumbents as a way of validating the list of job fundamentals. This information is then given to course developers for use in building training programs.

RN 79-6. Wortman, D. B., & Hixson, A. F., III (Pritsker & Associates, Inc.). A SAINT model of the AN/TSQ-73 missile minder: User's guide. August 1978. (AD A068 998)

Systems Analysis of Integrated Networks of Tasks (SAINT) is a network modeling and simulation technique developed to help design and analyze complex, man-machine systems. SAINT provides the concepts necessary to model systems that consist of tasks (discrete elements), state variables (continuous elements), and interactions between them. It facilitates the assessment of the contribution that system components make to overall system performance.

This programmer guide consists of five major sections. The introduction describes the model purpose and background. Section two describes in detail the 88 tasks that represent the full range of system interactions required by a 25L system operator/repairman. Section three deals with user subprograms. Section four describes the data input procedures.

To use the manual effectively, the programmer should first study the SAINT support documentation, then examine the network drawing of the model and the sample input and output. When an overview is firmly in mind, details on individual tasks can be obtained by reading each task description, the associated user functions, moderator functions, and resource descriptions. The manual has been designed to permit a potential user to trace any task sequence of interest at any depth desired.

RN 79-7. Miller, R. L. (General Research Corporation). Barracks living: The effects of stimulus reduction/enrichment on performance skills. June 1978. (AD A069 885)

This research examines the effects of long-term environmental isolation on individual's cognitive, perceptual, and job skills. In Study I, soldiers received tests of cognitive and perceptual skills both before and after three months of relative isolation on the military kaserne to which they were assigned. In Study II, soldiers were classified as isolates or nonisolates by supervisory personnel at three stages of their overseas tour; 1 to 9 months, 10 to 18 months, and 19+ months. The results indicated that the cognitive and perceptual skills of isolated soldiers were negatively related to time. Job performance and discipline problems also appeared related to barracks isolation.

RN 79-8. Pester, R. F. (General Electric Company). Laboratory development of computer generated image displays for evaluation in terrain flight training. February 1979. (AD A070 065)

This research provided stimulus material to allow evaluation of day-night Computer Image Generator (CIG) systems for training helicopter navigators and pilots in nap-of-the-earth (NOE) flight operations.

Two techniques generated the necessary computer-generated visual scene data. In one, three motion-picture film strips were produced for each of three tracks over a special visual data base using a real-time laboratory CIG system. The other was the production of 48 still photographs of three different levels of scene detail made on the non-real-time CIG system. The report describes the necessary input data for formulation of digital data bases.

RN 79-9. Foskett, R. J. (Human Resources Research Organization). A technique for producing realistic photographs of tactical scenes employing model vehicles. May 1979. (AD A069 243)

A montage technique was developed by which photographs of model tanks can be combined with photographs of real terrain to produce realistic imagery. To accomplish this, a color slide of a real terrain background is projected onto a white screen. Small black-and-white photographs of the model vehicles are then positioned on the projection in realistic deployments. The montage is then photographed to produce the final training imagery.

This procedure will permit training developers to obtain imagery that is tailored to their needs. That is, they can choose the type of terrain desired, show various kinds of deployments, and can display both Warsaw Pact and NATO vehicles in the same scene.

RN 79-10. Long, G. E., Ciley, C. D., Jr., Hockenberger, R. L., & Garlichs, E. A. (Canyon Research Group, Inc.). Development of unit training and evaluation techniques for combat-ready helicopter pilots: Task 1. Development of an instruction program for individual and unit training with combat-ready pilots. May 1979. (AD A069 242)

This report describes the research effort to aid the development of training and evaluation techniques and procedures for combat-readiness training of pilots.

The development effort resulted in a partial training module for premission planning and a technique to be used in training for night flight operations. Design and development for the premission planning training module focused on the partial solution of task simplification. This effort produced two versions of a checklist for premission planning, the second being an expanded version of the first. The expanded checklist is intended for use in early training and for use by less experienced aviators. The simpler version is used in later phases of training by more experienced aviators.

The premission checklist incorporates the following steps: (a) acquire premission information; (b) conduct mission planning; (c) conduct contingency planning, and (d) conduct crew briefing and premission checks.

The solution to night flight training operations proposed in this report consists of the use of light-attenuating goggles worn by the pilots during daytime flight. The devices simulate the nighttime environment, and their use would form the basis for future development of a complete training module for training in night flight operations.

RN 79-11. Ciley, C. D., Jr., & Long, G. E. (Canyon Research Group, Inc.). Development of unit training and evaluation techniques for combat-ready helicopter pilots: Task 2. Assessment of ARTEP and ATM training objectives and requirements for maintaining operational readiness. May 1979. (AD A069 224)

The recently published Army Training and Evaluation Programs (ARTEP) and Aircrew Training Manuals (ATM) represent a new concept of Army aviation unit training. Commanders are now responsible for determining the training requirements of their individual units and for developing and implementing programs to meet those requirements. The ARTEP and ATMs were designed to assist the unit commanders in carrying out that responsibility. This report presents the results of a brief review of the utility of these documents in the field and the extent to which their content adequately represents the training objectives and requirements for maintaining combat readiness. The research concludes that the documents have been well received and are being utilized effectively by field commanders; that they contain a valid, though not entirely complete, reflection of combat-readiness training objectives and requirements; but that the required recordkeeping is burdensome and there is a need for a more effective feedback system between its users and its developers.

RN 79-12. Polit, D., Weissbach, S., & Nuttall, R. L. (Laboratory for Statistical and Policy Research, Boston College). Techniques for research on factors affecting the utilization of women in non-traditional roles. April 1978. (AD A069 163)

This study compared and contrasted questionnaire types to discover the format most effective for a future Army-wide survey concerning attitudes toward the roles of women. Approximately 1,100 soldiers participated in the survey. Methodological issues involved comparison of Likert and multiple-choice style questions. The traditional method of marking answers (circling desired alternative response) was compared to the use of OPSCAN answer sheets (which are separate from questionnaire booklets). Also, a dispersed version of the questionnaire was tested against a compact version. On half the questionnaires, respondents were asked about men first; on the remaining half, questions were asked about women first. Significantly, minor manipulations of format and style did not greatly influence respondents' answers.

The study was also designed to yield preliminary data bearing on substantive attitudinal questions. Most respondents felt that women had an important role to play in the Army. By far, the majority of respondents thought that a company could do a better job at full strength with women than at below strength without women.

RN 79-13. Edmonds, W. S., & Nordlie, P. G. (Human Sciences Research, Inc.). Analysis of race relations/equal opportunity training in Korea. November 1977. (AD A069 244)

This is one in a series of reports from an on-going study of Army race relations and equal opportunity (RR/EO) training. This study is limited to Korea and discusses (a) racial climate in Korea, (b) conduct of unit RR/EO seminars in Korea, and (c) current attitudes toward the RR/EO program in general and the racial awareness program in particular. A division-sized unit was selected for study.

In general it was found that the racial climate is more negative in Korea than in the Continental United States (CONUS). Blacks perceived more discrimination occurring in Korea, and whites perceived more "reverse discrimination" compared with CONUS.

Required RR/EO seminars appear to be held somewhat less frequently than in CONUS. Overall conduct of seminars closely resembles that of CONUS. As in CONUS, the priority of the program appeared to be quite low.

The credibility of RR/EO programs in Korea also appears to be low; most personnel perceive that the programs are "just for show." The results suggest that racial tensions are high in Korea and that the RR/EO unit training is not effectively achieving program objectives.

RN 79-14. Rose, A. M., Motoyama, T., & Allen, T. W. (American Institutes for Research); & Drillings, M. (ARI). *__Performance effectiveness in combat job specialties: Additional studies__. February 1979. (AD A069 078)*

Because of the discrepancy between the tasks the combat soldier is responsible for and the tasks he performs as part of his peacetime duty assignment, the Army initiated a two-phase exploratory study of this phenomenon and of its consequences for individual training and evaluation.

During the first phase, personal, Army, and job background information was obtained from approximately 200 11E armor crewmen. Also collected was information about the congruence between an individual's day-to-day activities and the combat activities associated with the crew position in which he was to be tested. All troops were then given a series of hands-on performance tests.

During both phases of this study, the obtained data were cast into several types of analyses in which background and task congruence variables were examined as predictors of four kinds of performance measures: scores from the hands-on performance test, scores from a readministration of that test, SQT scores, and confidence estimates obtained from the soldiers regarding their ability to perform tasks included in the performance test. Four separate sets of analyses were carried out, one for each crew position.

The major finding of this study was that different aspects of performance (as measured by confidence estimates, hands-on performance tests, and SQT scores) could be predicted to a limited degree from a relatively small number of variables. However, significant predictions could be made only for individual tasks; predictions varied for different tasks in any given crew position. Thus the relationship between a soldier's day-to-day activities and his performance on projected combat tasks, while somewhat more systematic than previously found, is still complex and is task- and soldier-specific.

RN 79-15. King, B. C., Griffin, E. L., Ohmart, J. G., & Riebenack, A. D. (Martin Marietta Aerospace). Design reationale and performance specifications for a visual flight research facility (VFRF). November 1975. (AD A069 707)

This report documents a concept definition study for a Visual Flight Research Facility (VFRF) oriented toward research on nighttime nap-of-the-earth flight. A VFRF System specification included performance, design, development, and test requirements for an approach to achieving displayed windscreen image fidelity to actual night viewing conditions, and to allowing measurement of visually dependent flight crew tasks.

RN 79-16. Yoder, J., & Rice, R. W. (State University of New York at Buffalo); Adams, J., & Prince, H. T., II (U.S. Military Academy); & Hicks, J. M. (ARI). The relationship between leader personality characteristics and group task performance. July 1979. (AD A077 176)

The revival of interest in personality characteristics of a leader that predict group task performance led us to examine the data sets of Projects Athena and Sentinel. We identified and factor analyzed 25 personality measures to yield a set of nine personality measures: leadership ability, attitudes toward women, least preferred coworker (LPC), verbal and math SAT, male- and female-valued qualities, locus of control, and self-concept. Male and female cadets led three-man groups in a structured and an unstructured task. Male leaders who rated themselves as low in feminine qualities led groups that performed well on the unstructured task. More task-oriented (low LPC) female leaders led successful groups in the same task. No personality correlates were found for the structured task.

RN 79-17. Yoder, J., & Rice, R. W. (State University of New York at Buffalo); Adams, J., Prince, H. T., II, & Priest, R. F. (U.S. Military Academy); & Hicks, J. M. (ARI). Predicting institutional ratings of leadership ability for male and female cadets. July 1979. (AD A072 489)

The purpose of this report is to discover those variables associated with leadership ratings of male and female cadets throughout their first year at the U.S. Military Academy. Physical aptitude, organizational commitment, and a masculine self-image are positively related to high leadership scores during basic training. Additionally, these variables continue to be related to leadership ratings for women throughout the first academic year, but the same is not true for men. Plans to further examine these relationships are outlined.

RN 79-18. Childs, J. M. (Canyon Research Group, Inc.). Development of an objective grading system along with procedures and aids for its effective implementation in flight. May 1979. (AD A071 106)

This report describes the characteristics and test of two alternative inflight scoring procedures. These procedures were designed to provide, with minimal data collection, objective scores for Initial Entry Rotary Wing (IERW) student performance on Basic Instrument maneuvers. Four students were used for the Procedure 1 tests and eight students for the Procedure 2 tests.

The procedures were criterion-referenced and employed different performance criteria, sampling techniques, and scoring algorithms. Tests in the UH-1 simulator assessed the potential value of the various characteristics of each procedure. Results indicated in general those characteristics that best discriminated proficiency within and among students across training days.

RN 79-19. Mocharnuk, J. B., Marco, R. A., & Trelz, D. S. (McDonnell Douglas Astronautics Company); & Waldkoetter, R. O., & Milligan, J. R. (ARI). Selection and training of field artillery forward observers: Methodologies for improving target acquisition skills. July 1979. (AD A074 443)

Research was performed to identify prominent characteristics of Field Artillery forward observer (FO) selection and training that can be used to improve basic performance of FO tasks and thereby enhance the combat effectiveness of the fire support system.

The methodology incorporated profile development, task analysis, and training analysis. These research elements were supported by data obtained from (a) interviews with instructors and over 50 FOs or Fire Support Team (FIST) chiefs, (b) two questionnaires administered to Field Artillery Officer Basic Course (FAOBC) students, and (c) a questionnaire completed by 332 artillery officers.

The profile development activity examined critical characteristics, abilities, and personal histories of successful FOs; the task analysis identified the essential skills and knowledges needed in the FO combat role; and the training analysis reviewed the effectiveness of current FO training content, procedures, and techniques. The most important findings from the profile development activity were that those who demonstrate skill in basic map reading and navigation perform better, that math aptitude is important for successful FO performance, and that effective interaction of the FO with the maneuver unit is critical if the fire support mission is to be properly brought to fruition.

The task analysis clearly showed that map reading skills were among the most critical FO skills. Task by scenario interactions were found to be an important consideration in determining FO tasks and skill requirements. The training analysis revealed discrepancies in the list of tasks taught in FAOBC and the list of tasks emerging from the task analysis and identified alternative approaches. Methodology and procedures were suggested for increasing the effectiveness of FO and OBC training development.

INDEX

Authors

Actkinson, T. R., 52
Adams, J., 38, 94
Advanced Research Resources Organization, 36
Albert, D. D., 63
Alderman, I. N., 18
Allen, T. W., 93
American Institutes for Research, 26, 71, 93
Andrews, R. S., 61
Applied Psychological Services, Inc., 35, 44
Applied Science Associates, Inc., 3, 11, 81, 89
Army Research Institute Field Unit, USAREUR, 49
Ashley, J. L., 14
Atwood, M. E., 37, 41, 87

Badre, A. N., 76
Baldwin, R. D., 67
Banks, J. H., 3, 7, 9
Barber, H. F., 19, 20, 30, 61
Barnebey, S. F., 10
Bauer, R. W., 6
Bean, T. T., 46, 47
Beckwith, W. E., 84
Ben-Bassat, M., 77
Benesch, M. A., 64, 85, 86
Bennik, F. D., 64, 85, 86
Bentler, P. M., 18
Berkowtiz, M. S., 47
Bessemer, D. W., 59
Bialek, H. M., 82
Biggs, B. E., 14, 31, 59
Blackman, H. S., 24
Bleda, P. R., 6, 18, 23, 24, 29, 30, 57, 58
Bloomfield, J. R., 84
Boldovici, J. A., 12, 71
Bolin, S. F., 58
Bonner, B., 82
Bonnett, D. G., 84
Bosley, J. J., 89
Bowling Green State University, 71, 72, 73
Boycan, G. G., 71
Bradie, R., 16
Bradshaw, S. C., 14
Brennan, M., 82
Brennan, M. F., 55
Brown, G. H., 81
Bull, R. F., 69
Burt, R. A., 46, 47
Butler, A. K., 64, 85, 86
Buxton, W. A., 61
Byham, W., 67
Bynum, J. A., 12

Campbell, C. H., 68
Campbell, G. D., 41
Campbell, R. C., 68
Canyon Research Group, Inc., 10, 91, 92, 94
Cartner, J. A., 19
Channon, J. B., 42
Chastain, G. D., 9, 73, 75, 76
Childs, J. M., 94
Ciccone, D. S., 42
Ciley, C. D., Jr., 91, 92
Cockrell, J. T., 21
Cohen, A. S., 83
Cohen, S. L., 41
Collins, B. E., 18
Collins, T., 51
Comeau, R. F., 45
Connelly, E. M., 45
Cook, J. R., 69
Cory, B. H., 26

Dapra, R. A., 67
Davis, W. P., 87, 88
Decision Research, 64
Decisions and Designs, Incorporated, 67
Development Dimensions, International, 67
Downey, R. G., 14, 15, 23, 26
Dressel, J. D., 11, 54
Drillings, M., 93
Duffy, P. J., 14, 23, 26
Dyer, F. N., 28

Eakins, R. C., 5
Eastman, R. F., 56
Edmonds, W. S., 80, 92
Elliott, T. K., 81
Emerick, J., 84

Epstein, K. I., 3
Erwin, D. E., 31, 50

Farrell, J. P., 20, 30
Farrell, L. M., 68
Fields, A. F., 18
Fiman, B. G., 80
Fineberg, M. L., 23
Fingerman, P. W., 71
Finley, D. L., 4
Fischhoff, B., 64
Fischl, M. A., 22
Florida State University, 41, 42, 45, 70, 85
Foley, D. R., 40
Ford, J. P., 68
Foskett, R. J., 67, 75, 91
Frederickson, E. W., 89
Freer, D. R., 89

Gade, P. A., 18, 27
Garlichs, E. A., 91
General Electric Company, 90
General Research Corporation, 61, 82, 90
Georgia Institute of Technology, 76
Gerson, R. F., 41, 70, 85
Gertman, D., 27
Gilbert, A. C. F., 15, 16, 28
Glickman, A. S., 36
Goldberg, S. L., 11
Grafton, F. C., 16
Graham, W. R., 81
Gray, B. B., 56
Griffin, E. L., 94
Griffin, G. R., 9, 77
Griffith, D., 51, 52
Guard, N. R., 11
Guion, R. M., 71, 72, 73

Hadley, H. I., 88
Hagman, J. D., 6
Hannaman, D. L., 9
Harabedian, A., 16, 17
Hardy, G. D., Jr., 3, 7, 9
Harrison, P. C., Jr., 39
Hart, F. L., 88
Hart, R. J., 34, 47
Haverland, E. M., 66
Havron, M. D., 63, 78, 79
Hawkins, H. H., 15
Hayes, J. F., 50, 61, 77
Helme, W. H., 29
Hemingway, P. W., 36, 73, 76
Hennessy, R. T., 10
Herot, C., 83
Herzer, I., 69
Hibbits, N., 35
Hicks, J. M., 48, 51, 94
Hill, H., 78
Hilligoss, R. E., 5, 28
Hixson, A. F., III, 90
Hockenberger, R. L., 10, 91
Holman, G. L., 6, 12
Holmgren, J. E., 5, 69
HRB-Singer, Inc., 14, 31, 59
Hughes, C. R., 53
Hughes, R. G., 62
Human Factors Research, Inc., 16, 17
Human Resources Research Organization, 8, 9, 12, 35, 36, 55, 56, 65, 66, 67, 68, 71, 73, 74, 75, 76, 78, 81, 82, 91
Human Sciences Research, Inc., 63, 79, 80, 89, 92
Huntoon, R. B., 21

Institute for Research, 39
Integrated Sciences Corporation, 68
Ironson, G. H., 73
Irving, G. W., 68
Isley, R. N., 10, 70

Jeffrey, T. E., 16, 17, 20
Johnson, C. D., 26
Johnson, T. M., 57
Jones, D. R., 9, 88
Jorgensen, C. C., 11
Joyce, R. P., 3, 81

Kaplan, I. T., 19, 20, 30
Kelly, C. W., III, 67
Ketron, Inc., 69
Kibler, A. W., 67
Kim, K. W., 70
King, B. C., 94
King, W. L., 81
Kinton, Inc., 9, 77, 88
Knerr, B. W., 60
Knerr, C. M., 28, 33
Kordak, R. S., 11
Korienek, G. G., 42, 45
Korotkin, A. L., 26, 87, 88
Kraemer, R. E., 59
Kress, G., 14
Kubala, A. L., 8, 9, 36, 65, 66, 67, 74, 75, 76

Laboratory for Statistical and Policy Research, Boston College, 92
Landee, B. M., 40
Leahy, W. R., 44
Leal, A., 77
Leger, M., 56
Levy-Leboyer, C., 84
Lichtenstein, S., 64
Lindquist, G., 68
Lippman, A., 45
Litton-Mellonics, 5, 69
Long, G. E., 91, 92

Mace, D. J., 39
Madni, A., 77
Maisano, R. E., 26
Manned Systems Sciences, 14
Marco, R. A., 69, 95
Marcus, A., 53
Marmurek, H. H., 84
Martinek, H., 14, 31, 39, 50
Martin Marietta Aerospace, 94
Massachusetts Institute of Technology, 45, 83
Maxey, J. L., 66
Mays, P. V., 69
McBer and Company, 58
McBride, J. R., 22
McCullough, T. J., 63
McDonnell Douglas Astronautics Company, 69, 95
McFarland, R. L., 14
McFarling, L. H., 78
McGrew, J. F., 61
McMullen, R. L., 81
Medlin, S. M., 25, 33, 38
Meliza, L. L., 3, 9
Michael, W. T., 11
Miller, E. E., 61
Miller, E. J., 10, 70
Miller, R. L., 90
Milligan, J. R., 36, 95
Mocharnuk, J. B., 95
Moore, M. V., 22
Moses, F. L., 26, 40
Motoyama, T., 93
Myers, D., 36

Narva, M. A., 60
Mawrocki, L. H., 22
Negroponte, N., 45, 83
Nieva, V. F., 36
Nordlie, P. G., 80, 92
Nuttall, R. L., 92

Ohio State University Research Foundation, 84
Ohmart, J. G., 94
O'Neil, H. F., Jr., 47
Onoszko, P. W. J., 89
Perceptronics, Inc., 40, 42, 77
Performance Measurement Associates, Inc., 45
Pester, R. F., 90
Peters, J. I., 23
Pfeiffer, M. G., 35
Phelps, R. H., 67
Pieper, W. J., 11
Pilette, S. S., 14, 31, 59
Polit, D., 92
Potash, L. M., 20, 32, 40
Priest, R. F., 94
Prince, H. T., II, 94
Pritsker & Associates, Inc., 90

Ramsey, H. R., 37, 41, 87
Raney, J. L., 15, 44
Raytheon Company, 16
Raytheon Company/Autometric, 16, 17
Rene Descartes University, Paris, 84
Rice, R. W., 38, 43, 94
Richard A. Gibboney Associates, Inc., 81, 87
Richer, L. S., 43
Ridsdale, S., 41, 42, 45, 85
Riebenack, A. D., 94
Rigg, K., 56
Rockwell International Corporation, 21
Root, R. T., 28, 33, 77
Rose, A. M., 93
Ross, R. M., 22
Rumsey, M. G., 67
Ryan, T. G., 44

Samet, M. G., 40, 42
Savell, J. M., 18, 57
Schendel, J. D., 7
Schohan, B., 21
Schulz, R. E., 35
Science Applications, Inc., 37, 41, 46, 47
Scott, T. D., 3, 7, 9
Seguin, E. L., 39
Seidel, R. J., 35
Severino, A. A., 28
Sevilla, E. R., Jr., 89
Seville Research Corporation, 10, 70
Sewell, E., 16, 17

Shaket, E., 77
Shelnutt, J. B., 69
Shields, J. L., 3, 11, 54
Shiflett, S., 23, 26, 41
Shipley, B. D., Jr., 46, 69
Showel, M., 55
Shriver, E. L., 9, 77
Shuler, L., Jr., 35
Shvern, U., 21, 32
Siegel, A. I., 35, 44
Silver, L. A., 64, 85, 86
Simutis, Z. M., 22
Singer, R. N., 41, 42, 45, 70, 85
Smith, K. H., 79
Smith, M. G., 88
Smith, N. D., 49
Smutz, E. R., 13, 52, 53
Snyder, H. L., 84
Spears, W. D., 70
Spencer, L. M., Jr., 58
State University of New York at Buffalo, 38, 43, 94
Stephenson, R. W., 26
Stewart, S. R., 61
Strasel, H. C., 4
Sulzen, R. H., 7, 9, 18
Swezey, R. W., 5
Swiss Federal Institute of Technology, 83
System Development Corporation, 64, 85, 86

Taylor, S. E., 35
Tei, B. E., 84
Thompson, T. J., 19
Tiede, R. V., 46, 47
Tierney, T. J., Jr., 19
Ton, W. H., 65, 73, 75
Traub, B. H., 84
Trelz, D. S., 95
Turner, A. A., 37
Turney, J. R., 41

Uhlaner, J. E., 29
University of California, Los Angeles, 18
U.S. Army, 15, 33, 39, 51, 57
U.S. Army Training Support Center, 28
U.S. Military Academy, 38, 43, 94

VanWert, J. R., 3
Vidmar, R. L., 69
Virginia Polytechnic Institute and State University, 84
Vitters, A. G., 43
Voisin-Vedrenne, B., 84
Vreuls, D., 10

Wagner, H., 35
Waldkoetter, R. O., 15, 36, 95
Walker, C. H., 24
Wallis, M. R., 81, 87
Wanschura, R. G., 63, 78, 79
Warnick, W. L., 8, 66, 73, 74, 76
Watson, S. R., 67
Weinzapfel, G., 83
Weissbach, S., 92
Weldon, J. I., 51
Wellins, R. S., 67
Wheaton, G. R., 71
White, L., 81
Woelfel, J. C., 18, 57
Wolf, J. J., 44
Wood, M. D., 81
Word, L. E., 3, 28, 33, 77
Wortman, D. B., 90

Yates, L. G., 4, 50, 55
Yekovich, F. R., 24
Yoder, J., 38, 94

Zarin, A., 39

Subject Areas

air defense, 11, 89, 90
aircrew performance, 9, 12
aircrew selection, 46, 56, 69, 81
aircrew training methods, 10, 45, 91, 92, 94
armor crew simulation, 71
armor training & performance, 6, 12, 62, 66, 71
artillery training, 51, 91
auditory perception, performance enhancement in, 27

basic research, 24

combat training, 38
command & control, 18, 19, 20, 30, 44, 46, 47, 61, 69, 76
computer-based educational systems, 22, 35, 47
computer displays, 83
continuous operations, 35, 74

decision support, 64, 67, 76, 77

educational concepts & evaluation, 60, 64, 85, 86
engagement simulation training, 28, 33, 77, 89
enlisted accession & utilization, 22, 81
enlisted careers, 15
evaluation technology, 93

flight simulation, 6, 10, 31, 70, 90

human performance factors (basic research), 83, 84
human performance in field assessment, 8, 9, 13, 49, 51, 52, 53, 56, 65, 66, 67, 73, 74, 75, 76
human relations management, 80, 92

image interpretation, 21
information processing & display, 40, 42, 68, 76, 83
information techniques (basic research), 45
intelligence systems, 32

land navigation & night operations, 23
leadership, 23, 26, 28, 29, 38

maintenance training, 54
map displays & formats, 20, 26, 36
motivation & training, 18, 24
motor skills training (basic research), 41, 42, 45, 70, 85

night operations, training for, 9, 12, 29, 30, 57, 58, 75
night vision (simulation), 6, 23, 29, 30

officer accession, 51, 67
officer assessment & development, 14, 15, 16, 23, 28
officer career development, 26, 87, 88
officer training, 28, 29, 67, 79, 81
officer training (basic research), 94
organizational effectiveness, 41, 58, 84
orientation skills, 23, 36

personnel management (basic research), 44
programming, human factors in, 37, 39, 41, 64, 87

race relations, 34
racial harmony training, 47

sensor systems, 31, 32, 59
skill retention, 53, 82, 90
soldier productivity, 57
suppression, 76
surveillance systems, 16, 17, 84
symbology, 36, 76
systems development & training, 4

tactical skill training & retention, 9, 53
tactical team performance, 3, 7, 9, 14, 28, 63, 77, 78, 79
target identification, 8, 21, 66, 67, 73, 75
training, in operational units
  individual, 5, 11, 55, 64, 69, 82, 85, 86, 88
  performance based, 3, 6, 7, 11, 36, 68
  unit in USAREUR, 4, 50, 61
  unit, standards & evaluation, 25
training & evaluation (basic research), 71, 72, 73
training device technology, 75, 91, 94
training device validation, 60
training effectiveness analysis, 19
training literature, 55
training retention, 11
training simulation, 10, 59, 70, 71
training technology, 50

women in the Army, 18, 48, 92

Blank Page

LIBRARIES PARTICIPATING IN THE DOCUMENTS EXPEDITING PROJECT

ALABAMA

65 University of Alabama
ATTN: Reference Department
University, Alabama 35486

ARIZONA

69 American Graduate School of
International Management
ATTN: Russell Sears
Thunderbird Campus - Library
Glendale, Arizona 85306

53 Arizona State University
ATTN: Documents Librarian
Acquisitions Services
Tempe, Arizona 85281

82 University of Arizona
ATTN: Documents Librarian
Acquisitions Department
Tucson, Arizona 85721

CALIFORNIA

13 University of California, Berkeley
ATTN: General Library
Documents Department
Berkeley, California 94720

105 California State University, Chico
ATTN: The Library
Chico, California 95926

108 University of California, Davis
ATTN: Library, Patricia Einouye, Doc Libr
Documents Department
Davis, California 95616

132 California State University, Fresno
ATTN: Ms. Eloiss Wilson
Acquisitions Department
Fresno, California 93710

CALIFORNIA (continued)

10 University of California, L.A.
ATTN: Library
Government Publications Room
Los Angeles, California 90024

21 University of Southern California Library
ATTN: Government Documents Department
Los Angeles, California 90007

12 Updata Publications Inc.
ATTN: M. Herbert Sclar
1756 Westwood Boulevard
Los Angeles, California 90024

117 California State University, Northridge
ATTN: Library
Government Documents
18111 Nordhoff Street
Northridge, California 91324

96 University of California Library, Riverside
ATTN: Government Publications Department
Riverside, California, 92507

28 California State Library
ATTN: Documents Section
Sacramento, California 95809

31 San Diego State University
ATTN: Documents Library
Malcome A. Love Library
San Diego, California 92182

89 University of California, Santa Barbara
ATTN: The Library
Government Publications Department
Santa Barbara, California 93106

102 University of California, Santa Cruz
ATTN: Library
Documents Section
Santa Cruz, California 95060

143 Stanford University Libraries
ATTN: Joan Loftus, Federal Librarian
Stanford, California 92507

121 California State College, Stanislaus
Library - Acquisitons Dept.
Turlock, California 95380

COLORADO

16 University of Colorado at Denver
Auraria Libraries
ATTN: Ms. Jan Fontaine, Head
Acquisitions Section
Lawrence at 11th Street
Denver, Colorado 80204

44 University of Northern Colorado
Government Publications Service - Library
Greeley, Colorado 80639

CONNECTICUT

115 University of Bridgeport
ATTN: The Library
Bridgeport, Connecticut 06602

62 Yale University Library
ATTN: Government Publications Collection
New Haven, Connecticut 06520

52 University of Connecticut
ATTN: Government Publications Department
Wilber Cross Library
Storrs, Connecticut 06268

DELAWARE

91 University of Delaware
ATTN: Library
Documents Department
Newark, Delaware 19711

DISTRICT OF COLUMBIA

84 American University
ATTN: Library/Acquisitions
Washington, D.C. 20016

98 Georgetown University
ATTN: Dominic Provenzano
Government Documents Department
Lauinger Library
Washington, DC 20057

142 Johns Hopkins University
School of Advanced International Studies
ATTN: Peter Promen
1740 Mass. Ave, NW
Washington, D.C. 20036

DISTRICT OF COLUMBIA

142 US Department of Justice
ATTN: Librarian
Civil Division Library - Rm 3344
10th & Pa. Avenue, NW
Washington, D.C. 20530

24 American University
ATTN: Foreign Area Studies
Gilda Nimer, Librarian
5010 Wisconsin Ave, NW
Washington, DC 20016

FLORIDA

59 Florida State University
Attn: Mable Stafford
Head, Serials Division
Tallahassee, Florida 32306

GEORGIA

114 Emory University
ATTN: Serials & Binding Department
Robert W. Woodruff Library
Atlanta, Georgia 30322

HAWAII

47 University of Hawaii Library
ATTN: Ms. Patricia Sheldon, Head
Govt Docs Collection
2550 - The Mall
Honolulu, Hawaii 96822

IDAHO

43 University of Idaho
ATTN: Controllers Office
Room 101 AD Office Bldg
Moscow, Idaho 83843

ILLINOIS

93 Southern Illinois University
ATTN: General Library
Serials Department
Carbondale, Illinois 62901

63 Chicago Public Library
Attn: Governments Publications Dept
425 N Michigan Ave
Chicago, Illionis 60611

ILLINOIS

3 University of Chicago Library
ATTN: Mr. Charles Halzer
1100 East 57th Street
Chicago, Illinois 60637

80 University of Illinois
Documents Section
Chicago Circle
P.O. Box 8198
Chicago, Illinois 60680

109 Northern Illinois University
ATTN: Founders Memorial Library
Government Publications Department
DeKalb, Illinois 60115

20 Northwestern University
ATTN: Documents Division
Evanston, Illinois 60201

126 Western Illinois University
ATTN: Library
Documents Librarian
Macomb, Illinois 61455

103 Illinois State University
ATTN: Milner Library
Documents Department
Normal, Illinois 61761

64 Illinois State Library
ATTN: Government Documents Branch
Centennial Building
Springfield, Illinois 62706

61 Sangamon State University Library
ATTN: Documents Department
Springfield, Illinois 62701

15 University of Illinois Library
ATTN: Gift and Exchange
Urbana, Illinois 61803

INDIANA

67 Indiana University Library
ATTN: Alice Wickizer, Documents Librarian
Bloomington, Indiana 47401

36 Indiana State Library
ATTN: Documents Librarian
140 North Senate Avenue
Indianapolis, Indiana 46204

INDIANA

42 Purdue University Libraries
ATTN: Acquisitions Department
Lafayette, Indiana 47907

57 Ball State University
ATTN: Library
Muncie, Indiana 47306

71 Indiana State University
ATTN: Library
Acquisitions Department
Terre Haute, Indiana 47809

IOWA

106 University of Northern Iowa
ATTN: Library - Serials - A
Cedar Falls, Iowa 50613

139 Drake University
ATTN: Cowles Library
Des Moines, Iowa 50311

KANSAS

66 University of Kansas Library
ATTN: Marion Howey, Documents Librarian
Lawrence, Kansas 66045

30 Kansas State University Library
ATTN: Acquisitons
Manhattan, Kansas 66504

KENTUCKY

119 University of Kentucky
ATTN: University Libraries
Continuations Division, Acquisitions Dept.
Lexington, Kentucky 40506

LOUISIANA

86 Tulane University Library
ATTN: Government Documents Section
New Orleans, Louisiana 70118

MARYLAND

137 National Library of Medicine
ATTN: Technical Servicws Division S/A
8600 Rockville Pike
Bethesda, Maryland 20014

94 University of Maryland,
McKeldin Library
ATTN: Documents and Map Room
College Park, Maryland 20742

MASSACHUSETTS

95 University of Massachusetts
ATTN: Serials Department
Amherst, ~~Massachusetts~~ 01002

92 Boston Public Library
ATTN: Serials Receipts
Boston, Massachusetts 02117

78 Harvard College Library
ATTN: Government Documents Section
Ms. Vida Margaitis, Ref. Lib for Docs
Cambridge, Massachusetts 02138

78 Harvard University
ATTN: CSIA Library
Kennedy School of Government
79 Boylston Street
Cambridge, Massachusetts 02138

4 Tufts University
ATTN: Donald Altschiller
Fletcher School of Law and Diplomacy
Edwin Ginn Library
Medford, Massachusetts 02155

45 Mount Holyoke College
Williston Memorial Library
South Hadley, Massachusetts 01075

MICHIGAN

14 University of Michigan Library
ATTN: Documents Librarian
Ann Arbor, Michigan 48104

7 Detroit Public Library
ATTN: Book Receiving Department
5201 Woodward Avenue
Detroit, Michigan 48202

32 Gale Research Company
ATTN: Annie Brewer
Book Tower
Detroit, Michigan 48226

51 Wayne State University Library
Documents Secton
5224 Gullen Mall
Detroit, Michigan 48202

MINNESOTA

118 Minneapolis Public Library
Orders Dept
ATTN: Documents Expediting Project
300 Nicollet Mall
Minneapolis, Minnesota 55401

18 University of Minnesota Library
ATTN: Subscription Section
Serials Records
Minneapolis, Minnesota 55455

MISSOURI

23 University of Missouri Library
ATTN: Serials Department
Columbia, Missouri 65202

NEBRASKA

39 University of Nebraska Library
ATTN: Documents Librarian
Lincoln, Nebraska 68508

42-A University of Nebraska at Omaha
ATTN: Mrs Elizabeth N. Seng
University Library, Order
Omaha, Nebraska 68181

NEW HAMPSHIRE

58 University of New Hampshire
ATTN: Library Serial Department
Durham, New Hampshire 03824

79 Dartmouth College Library
ATTN: Reference Department
Hanover, New Hampshire 03775

NEW JERSEY

50 Rutgers University Library
ATTN: Government Publications Department
New Brunswick, New Jersey 08901

37 Princeton University Library
ATTN: Documents Librarian
Princeton, New Jersey 08540

NEW MEXICO

88 University of New Mexico
ATTN: General Library - GPMD
Charlie A. Seavey
Albuquerque, New Mexico 87131

NEW YORK

134 State University of New York
at Binghampton
ATTN: Library
Director of Technical Processes
Binghampton, New York 13901

77 Lehman College Library
ATTN: Acquisition Division
Serials Section
Bedford Park Blvd. West
Bronx, New York 10468

123 Brooklyn College Library
ATTN: Prof. E. Svuksts
Documents Division
Bedford Avenue and Avenue H
Brooklyn, New York 11210

41 Brooklyn Public Library
ATTN: Technical Services Center
Acquisitions Department
109 Montgomery Street
Brooklyn, New York 11238

2 State University of New York
at Buffalo
ATTN: Acquisition Department
Lockwood Library Annex
Buffalo, New York 14214

38 Cornell University Library
ATTN: Government Documents
Ithaca, New York 14850

5 Columbia University Libraries
ATTN: Documents Service Center, Rm 327
420 West 118th St. Rm. 327
New York, New York 10027

131 New York City Association of the Bar
ATTN: Library
42 West 44th Street
New York, New York 10036

1 New York Public Library
ATTN: Government Documents
Fifth Avenue & 42d Street
New York, New York 10018

NEW YORK

120 New York Public Library
ATTN: ~~Book-~~Ordering Office - Periodicals
8 E. 40th Street
New York, New York 10016

140 Paul, Weiss, Rifkind, Wharton & Garrison
ATTN: Library
345 Park Avenue
New York, New York 10022

Readex Microprint Corporation
101 5th Avenue
New York, New York 10003

9 United Nations
ATTN: Dag Hammarskjold Library
Acquisitons Section
New York, New York 10163

75 State University of New York
at Stony Brook
ATTN: Main Library, Documents Section
Stony Brook, New York 11790

27 Syracuse University
ATTN: Serials Division
Syracuse, New York 13210

NORTH CAROLINA

6 University of North Carolina -
Chapel Hill
ATTN: Serials Department
Wilson Library 024-A
Chapel Hill, North Carolina 27514

48 Duke University
ATTN: Documents Librarian
Durham, North Carolina 27706

73 North Carolina State University
D. H. Hill Library
ATTN: Acquisitions Dept. (S)
Raleigh, North Carolina 27607

OHIO

129 University of Cincinnati
ATTN: Main Campus Library
Serials Department (Documents)
Cincinnati, Ohio 45221

43 Ohio State University Libraries
ATTN: Documents Division
Main Library
1858 Neil Avenue
Columbus, Ohio 43210

56 Kent State University
ATTN: Documents Librarian
Kent, Ohio 44240

72 Miami University Library
ATTN: Jean Sears, Documents Librarian
Oxford, Ohio 45056

OKLAHOMA

17 Oklahoma State University Library
ATTN: Documents Librarian
Stillwater, Oklahoma 74078

PENNSYLVANIA

34 Free Library of Philadelphia
ATTN: Public Documents Department
Logan Square
Philadelphia, Pennsylvania 19103

85 Temple University
ATTN: Documents Room
Samuel Paley Library
Philadelphia, Pennsylvania 19122

35 Carnegie Library of Pittsburgh
ATTN: Serials Unit
4400 Forbes Avenue
Pittsburgh, Pennsylvania 15213

RHODE ISLAND

26 Brown University
ATTN: Library
Documents Division
Providence, Rhode Island 02912

SOUTH CAROLINA

60 University of South Carolina
ATTN: Order Department
McKissick Memorial Library
Columbia, South Carolina 29208

TENNESSEE

70 University of Tennessee
ATTN: Documents Librarian
Knoxville, Tennessee 37816

TEXAS

11 University of Texas
ATTN: Documents Librarian
Law Library
2500 Red River
Austin, Texas 78705

76 University of Texas Library
ATTN: Central Serials Record
Austin, Texas 78712

25 Dallas Public Library
ATTN: Documents Librarian
Dallas, Texas 75201

54 Baylor University
Library - Serials Department
PO Box 6307
Waco, Texas 76706

UTAH

87 Utah State University UMC-30
ATTN: Leona K. Pisarz
Merrill Library
Logan, Utah 84322

81 Brigham Young University
ATTN: Library
Documents Section
Provo, Utah 84601

8 University of Utah
ATTN: Serials Order Department
Documents Section
Salt Lake City, Utah 84112

VERMONT

55 University of Vermont
ATTN: Director of Libraries
Guy W. Bailey Library
Burlington, Vermont 05401

VIRGINIA

40 University of Virginia Library
ATTN: Public Documents
Charlottesville, Virginia 22903

113 George Mason University
ATTN: Acquisitions Librarian
4400 University Drive
Fairfax, Virginia 22030

125 College of William & Mary
ATTN: Documents Department
Swem Library
Williamsburg, Virginia 23815

WASHINGTON

22 Washington State Library
ATTN: Serial Section
Library Building
Olympia, Washington 98504

90 Washington State University
ATTN: Social Science Library
Pullman, Washington 99164

19 University of Washington Libraries
ATTN: Serials Division
Seattle, Washington 98195

WISCONSIN

68 Milwaukee Public Library
ATTN: Acquisition Division
8I4 West Wisconsin Avenue
Milwaukee, Wisconsin 53233

OTHER

29 Biblioteek Voor
Hedendaagse Dokumentatie
Parklaan 2
B-2700 Sint Niklaas Waas
BELGIUM

Blank Page

Microfilmed From
Best Available Copy

DISTRIBUTION

1 US ARMY WESTERN COMMAND ATTN: APPE
1 HQDA ATTN: DAAG-ED
1 HQ, TCATA ATTN: ATCAT-OP-Q
1 HQ, USMEPCOM ATTN: MEPCT
2 HQDA RESEARCH AND STUDIES OFC
1 MILITARY OCCUPATIONAL DEVELOPMENT DIV DAPC-MSP-O, RM 852C HOFFMAN BLDG 1
1 HQDA OFFICE OF THE CHIEF OF CHAPLAINS
4 OASD (MRA AND L)
1 HQDA ATTN: DAMO-RQR
1 HQDA ATTN: DAPC-PMP-S, HOFFMAN BLDG 1
1 HQ TCATA TECHNICAL LIBRARY
1 6970TH AB GP BU 9801 SOCIAL ACTIONS OFC
1 HQDA ODCSPER
1 USRADCO, STC
1 HQDA ATTN: DAMI-ISI
1 USA AVIATION SYSTEMS COMD ATTN: DRSAV-ZDR
1 EQUAL OPPORTUNITY BRANCH ATTN: AFZT-PA-HR
1 USA CORADCOM ATTN: AMSEL-PA-RH
1 USA ARRADCOM ATTN: ATFE-LO-AC
1 HEADQUARTERS US MARINE CORPS ATTN: CODE MTMT
1 HEADQUARTERS, US MARINE CORPS ATTN: CODE MPI-20
2 US ARMY EUROPE AND SEVENTH ARMY
1 1ST INFANTRY DIVISION AND FT. RILEY ATTN: AFZN-DPT-T
1 CHIEF, ATTITUDE + OPINION SURVEY DIVISION ATTN: ATZI-NCR-MA, HOFFMAN BLDG II
1 USA INTELLIGENCE AND SECURITY COMMAND ATTN: IAOPS-TNG-T
2 HQ TRADOC TECHNICAL LIBRARY
1 NAVAL TRAINING EQUIPMENT CEN ATTN: TECHNICAL LIBRARY
1 MILITARY OCCUPATIONAL DEVELOPMENT DIRECTORATE ATTN: ATZI-NCR-MS-M, RM 3N33 HOFFMAN BLDG II
1 DATA ANALYSIS DIVISION ATTN: ATZI-NCR-MD, HOFFMAN BLDG II
1 USA MILPERCEN ATTN: DAPC-POO-T
1 FIRST ARMY HEADQUARTERS ATTN: ASKA-RT-IS
1 USAFACFA CHIEF, ORGANIZATIONAL EFFECTIVENESS BRANCH
1 USA ORDNANCE + CHEMICAL CENTER AND SCHOOL ATTN: ATSL-DTC-P
1 8TH INFANTRY DIVISION
1 HQDA ARMY FORCE MODERNIZATION COORDINATION OFFICE
1 HQDA ATTN: DASG-PTB
1 NAVAL AIR SYSTEM COMMAND /
1 DCSOPS (DIST 4) ATTN: DAMO-RQI
1 123D USARCOM RESERVE CENTER
1 US ARMY SOLDIER SUPPORT CENTER ATTN: ATSG-HDD (DR. CAVINESS)
1 DIRECTORATE OF ARMOR AVIATION ATTN: ATZK-AAD
1 USAARMC + FT. KNOX AVIATION DIVISION
1 USA FORCES COMMAND AFIN - DEPUTY C OF S FOR INTELLIGENCE
1 USA FORCES COMMAND AFPR - DEPTY CHIEF OF STAFF FOR PERSONNEL
1 USA FORCES COMMAND AFLG - DEPUTY CHIEF OF STAFF FOR LOGISTICS
1 USA FORCES COMMAND AFOP - DEPUTY CHIEF OF STAFF FOR OPERATIONS
1 US ARMY AIR DEFENSE SCHOOL ATTN: ATSA-DTD
1 DIRECTORATE OF TRAINING ATTN: ATZQ-T
1 DIRECTORATE OF COMBAT DEVELOPMENTS ATTN: ATZQ-D
1 HQDARCOM MARINE CORPS LIAISON OFC
1 DEPARTMENT OF THE ARMY US ARMY INTELLIGENCE + SECURITY COMMAND
1 US ARMY SAFETY CENTER ATTN: LIBRARIAN, BLDG 4905
1 ANNISTON ARMY DEPOT ORGANIZATIONAL EFFECTIVENESS
1 USA MISSILE COMMAND ATTN: DRSMI-NTN
1 ARTADS ATTN: DRCPM-TDS-TD
1 USA FORCES COMMAND
1 PM TRADE /
1 US MILITARY DISTRICT OF WASHINGTON OFC OF EQUAL OPPORTUNITY
1 NAVAL CIVILIAN PERSONNEL COMD SOUTHERN FLD DIV
22 ARI LIAISON OFFICE
1 HQ DARCOM DIRECTORATE FOR MANAGEMENT INFO SYSTEMS

Microfilmed From
Best Available Copy

1 USA DARCOM AUTOMATED LOG MGT SYS ACTIVITY
1 USA DARCOM LOGISTIC SYS SUPPORT ACTIVITY
1 7TH ARMY TRAINING COMMAND
1 HQ USAREUR ATTN: DCSOPS
1 ARMY TRAINING SUPPORT CENTER INDIVIDUAL TRAINING EVALUATION
1 HQDA. DCSOPS UNIT TRAINING
1 HQDA. DCSOPS INDIVIDUAL TRAINING
1 HQDA. DCSOPS TRAINING DIRECTORATE
1 HQDA. DCSLOG MAINTENANCE MANAGEMENT
1 HQDA. OCS STUDY OFFICE
1 DEPARTMENT OF THE NAVY HUMAN RESOURCE MANAGEMENT DIVISION (OP-15)
1 DEPARTMENT OF THE NAVY HUMAN RESOURCE MGT AND PERSONAL AFFAIRS DEPT
1 DEPARTMENT OF THE NAVY HUMAN RESOURCE MGT AND PERSONAL AFFAIRS DEPT
1 NAVAL MILITARY PERSONNEL COMMAND (N-62)
1 NAVAL MILITARY PERSONNEL COMMAND (N-61)
1 NAVAL MILITARY PERSONNEL COMMAND (N-4)
1 HUMAN RESOURCE MANAGEMENT CENTER
1 HUMAN RESOURCE MANAGEMENT CENTER
1 U.S. NAVY TRAINING ANALYSIS EVALUATION GROUP
1 USACDEC ATTN: ATEC-EX-E HUMAN FACTORS
1 ATTN: SM-ALC/DPCR
1 USAFAGOS/TAC SENIOR ARMY ADVISOR
1 INTER-UNIV SEMINAR ON ARMED FORCES + SOC
1 USA ELECTRONIC PROVING GROUND ATTN: STEEP-MT-ES
1 OASA (RDA) DEPUTY FOR SCIENCE AND TECHNOLOGY
1 OFC OF NAVAL RESEARCH /
1 AFHRL/LRT
1 AFHRL/LRLG
1 AIR FORCE HUMAN RESOURCES LAB ATTN: AFHRL/TSR
1 FEDERAL AVIATION ADMINISTRATION CENTRAL REGION LIBRARY, ACE-66
1 AFAMRL/BB
1 AFAMRL/HE
1 NAVAL PERSONNEL R AND D CENTER COMMAND AND SUPPORT SYSTEMS
1 NAVY PERSONNEL R AND D CENTER /
1 NAVY PERSONNEL R AND D CENTER DIRECTOR OF PROGRAMS
1 NAVY PERSONNEL R AND D CENTER /
1 US ARMY AVN ENGINEERING FLIGHT ACTIVITY ATTN: DAVTE-TD
2 OFC OF NAVAL RESEARCH PERSONNEL AND TRAINING RESEARCH PROGRAMS
1 NAVAL PERSONNEL R + D CENTER /
1 OFC OF NAVAL RESEARCH PROJECT OFFICER, ENVIRONMENTAL PHYSIOLOGY
1 OFC OF NAVAL RSCH ORGANIZATIONAL EFFECTIVENESS PRO.
1 MCFANN-GRAY + ASSOCIATES, INC. /
1 NAVAL AEROSPACE MEDICAL RSCH LAB AIRBORNE RANGER RESEARCH
1 DEPT. OF NATIONAL DEFENCE DEFENCE AND CIVIL INSTITUTE OF ENVIR MED
1 NAVAL AEROSPACE MEDICAL RSCH LAB AEROSPACE PSYCHOLOGY DEPARTMENT
1 USA TRADOC SYSTEMS ANALYSIS ACTIVITY ATTN: ATAA-TCA
1 HEADQUARTERS, COAST GUARD CHIEF, PSYCHOLOGICAL RSCH BR
1 6970 ABG (SL)
1 USA RESEARCH AND TECHNOLOGY LAB ATTN: DAVDL-AS (DR. R. S. DUNN)
1 USA ENGINEER TOPOGRAPHIC LABS ATTN: ETL-GSL
1 USA ENGINEER TOPOGRAPHIC LABS ATTN: STINFO CENTER
1 USA ENGINEER TOPOGRAPHIC LABS ATTN: ETL-TD-S
1 USA MOBILITY EQUIPMENT R AND D COMD ATTN: DRDME-TQ (SCHOOL)
1 NIGHT VISION LAB ATTN: DRSEL-NV-SDD
1 USA TRAINING BOARD ATTN: ATTG-ATB-TA
1 USA HUMAN ENGINEERING LAB
1 USAHEL LIAISON REP, USAAVNC /
1 USA MATERIEL SYSTEMS ANALYSIS ACTIVITY ATTN: DRXSY-C
1 USA RESEARCH OFC /
1 NAFEC HUMAN ENGINEERING BRANCH
1 BATTELLE-COLUMBUS LABORATORIES TACTICAL TECHNICAL OFC
1 USA ARCTIC TEST CEN ATTN: AMSTE-PL-TS

Microfilmed From
Best Available Copy

1 USA COLD REGIONS TEST CEN ATTN: STECR-OP
1 USA CONCEPTS ANALYSIS AGCY ATTN: CSCA-ROP
1 USA CONCEPTS ANALYSIS AGCY ATTN: CSCA-JF
1 DEFENSE LANGUAGE INSTITUTE FOREIGN LANGUAGE CEN
1 HQ WRAIR DIV OF NEUROPSYCHIATRY
1 USACACDA ATTN: ATZL-CAC-IC
1 USACACDA ATTN: ATZL-CAC-IM
1 USACAC ATTN: ATZL-CAC-IA
1 USACACDA ATTN: ATZL-CAC-A
1 USA ELECTRONIC WARFARE LAB CHIEF, INTELLIGENCE MATER DEVEL + SUPP OFF
1 USA RSCH DEVEL + STANDARDIZA GP, U.K.
1 AFWAL/FIGR (CDIC)
1 NAVY PERSONNEL RSCH + DEVEL CENTER ATTN: (CODE 307)
1 USA RESEARCH AND DEVELOPMENT LABS CHIEF, BEHAV SCIENCES DIV, FOOD SCI LAB
1 OASD, E AND E (E AND LS) MILITARY ASST FOR TNG + PERS TECHNOL
1 TRAJANA ATTN: SAJS-OR
1 NAVAL AIR SYSTEMS COMMAND ATTN: AIR-5313
1 ECOM ATTN: AMSEL-CT-O
1 USACDEC TECHNICAL INFORMATION CENTER
1 USAARL LIBRARY
1 HUMAN RESOURCES RSCH ORG (HUMRRO) /
1 SEVILLE RESEARCH CORPORATION
1 USA TRADOC SYSTEMS ANALYSIS ACTIVITY ATTN: ATAA-SL (TECH LIBRARY)
1 UNIFORMED SERVICES UNIT OF THE HEALTH SCI DEPARTMENT OF PSYCHIATRY
1 USA COMPUTER SYSTEMS COMMAND ATTN: COMMAND TECHNICAL LIBRARY H-9
1 HUMAN RESOURCES RSCH ORG (HUMRRO)
1 HUMRRO LIBRARY
1 EUSTIS DIRECTORATE, USAAMRDL TECHNICAL LIBRARY
1 BATTELLE REPORTS LIBRARY
1 RAND CORPORATION /
1 RAND CORPORATION ATTN: LIBRARY D
1 FEDERAL AVIATION ADMINISTRATION ATTN: CAMI LIBRARY ACC-44D1
1 NAFEC LIBRARY, ANA-64
1 GRONINGER LIBRARY ATTN: ATZF-RS-L BLDG 1313
1 CENTER FOR NAVAL ANALYSIS
1 NAVAL HEALTH RSCH CEN LIBRARY
1 NAVAL ELECTRONICS LAB ATTN: RESEARCH LIBRARY
1 NAVAL PERSONNEL R AND D CEN LIBRARY ATTN: CODE P106
1 AIR FORCE HUMAN RESOURCES LAB ATTN: AFHRL/OTS
1 HQ, FT. HUACHUCA ATTN: TECH REF DIV
1 USA ACADEMY OF HEALTH SCIENCES STIMSON LIBRARY (DOCUMENTS)
1 SCHOOL OF SYSTEMS AND LOGISTICS /
1 USAMERDC TECHNICAL LIBRARY
1 ERIC PROCESSING AND REFERENCE FAC ACQUISITIONS LIBRARIAN
1 DEPARTMENT OF THE NAVY TRAINING ANALYSIS AND EVALUATION GP
1 NATIONAL CENTER FOR HEALTH STATISTICS /
1 USMA DEPT OF BEHAVIORAL SCI AND LEADERSHIP
1 OLD DOMINION UNIVERSITY PERFORMANCE ASSESSMENT LABORATORY
1 USA COMMAND AND GENERAL STAFF COLLEGE ATTN: LIBRARY
1 USA TRANSPORTATION SCHOOL USA TRANSP TECH INFO AND RSCH CEN
1 NASA HQ /
1 NMRDC PROGRAM MANAGER FOR HUMAN PERFORMANCE
1 AFOSR/NL LIFE SCIENCES DIRECTORATE
1 OFFICE OF NAVAL RESEARCH DIRECTOR, PSYCHOLOGICAL SCIENCES DIV
1 NAVAL MEDICAL R AND D COMMAND (44)
1 USA ADMINCEN TECHNICAL RESEARCH BRANCH LIBRARY
2 HQDA USA MED RSCH AND DEVEL COMMAND
1 USA FIELD ARTY BD /
1 NAT CLEARINGHOUSE FOR MENTAL HEALTH INFO PARKLAWN BLDG
1 U OF TEXAS CEN FOR COMMUNICATION RSCH
1 INSTITUTE FOR DEFENSE ANALYSES
1 USA TRAINING SUPPORT CENTER ATTN: ATIC-DST-PA

Microfilmed From
Best Available Copy

1 AFHRL TECHNOLOGY OFC (H)
1 PURDUE UNIV DEPT OF PSYCHOLOGICAL SCIENCES
1 USA MOBILITY EQUIPMENT R AND D COMMAND ATTN: DRDME-ZG
1 HQ, USA MDW ATTN: ANPE-OE
1 NAVAL TRAINING EQUIPMENT CENTER HUMAN FACTORS LAB
1 OHIO UNIVERSITY INSTITUTE FOR URBAN + RURAL DEVELOPMENT
1 SINGER, INC. LINK DIVISION
1 APPLI-MATION INC.
1 DA US ARMY RETRAINING BDE RESEARCH + EVALUATION DIVISION
1 OHIO STATE UNIVERSITY CENTER FOR HUMAN RESOURCE RESEARCH
1 ADVANCED TECHNOLOGY LTD. MILITARY + REAL-TIME SYSTEMS DIV.
1 FLORIDA STATE UNIVERSITY CENTER FOR EDUCATIONAL TECHNOLOGY
1 CALSPAN HUMAN FACTORS AND TRAINING CENTER
1 DANVILLE RESEARCH ASSOCIATES, INC.
1 ESSEX CORPORATION ATTN: DR. BOB WATERS
1 HAZELTINE CORPORATION ATTN: DR. STONE
1 USA AEROMEDICAL RESEARCH LAB SCIENTIFIC INFORMATION CENTER
1 RAYTHEON SERVICE COMPANY SPENCER LABORATORY
1 HUMAN RESOURCE MANAGEMENT CEN, SAN DIEGO
1 USAFA DEPT OF BEH SCI + LEADERSHIP
1 USAF SCHOOL OF AEROSPACE MEDICINE AEROMEDICAL LIBRARY (TSK-4)
1 US MILITARY ACADEMY DEPT. OF HISTORY, BLDG 601
1 USA INTELLIGENCE CEN AND SCH ATTN: SCHOOL LIBRARY
1 USA INTELLIGENCE CEN AND SCH ATTN: ATSI-DT-DL
1 MARINE CORPS INSTITUTE
1 NAVAL SAFETY CENTER /
1 US COAST GUARD TNG CEN ATTN: EDUCATIONAL SVCS OFFICER
1 USAAVNC AND FT. RUCKER ATTN: ATZQ-ES
1 US ARMY AVN TNG LIBRARY ATTN: CHIEF LIBRARIAN
1 USA AIR DEFENSE SCHOOL ATTN: ATSA-DT
1 USAAVNC ATTN: ATZQ-D
1 US MILITARY ACADEMY DIRECTOR OF INSTITUTIONAL RSCH
1 USA AIR DEFENSE SCHOOL ATTN: ATSA-CD-MS
1 USAAVS-LIBRARY-DOCUMENTS
1 USA AIR DEFENSE BOARD ATTN: FILES REPOSITORY
1 USA SERGEANTS MAJOR ACADEMY ATTN: LEARNING RESOURCES CENTER
1 USA INFANTRY BOARD ATTN: ATZB-IB-AE
1 USA INTELLIGENCE CEN AND SCH ATTN: ATSI-DOTD-SF
1 USA ORDNANCE CEN AND SCH ATTN: ATSL-TD-TAC
1 USA ARMOR SCHOOL ATTN: ATZK-TD
1 USA ARMOR CENTER DIRECTORATE OF COMBAT DEVELOPMENTS
1 NAVAL POSTGRADUATE SCH ATTN: DUDLEY KNOX LIBRARY (CODE 1424)
1 USA TRANSPORTATION SCHOOL DEPUTY ASST. COMMANDANT EDUCA. TECHNOLOGY
1 USA SIGNAL SCHOOL AND FT. GORDON ATTN: ATZH-ET
1 USA QUARTERMASTER SCH ATTN: ATSM-TNG-TM-ET
1 USA MILITARY POLICE SCHOOL ATTN: LIBRARY
1 USA ARMOR CENTER + FT. KNOX OFFICE OF ARMOR FORCE MGT + STANDARDIZATION
1 CHIEF OF NAVAL EDUCATION AND TNG /
1 USA SIGNAL SCHOOL + FT. GORDON EDUCATIONAL TECHNOLOGY DIVISION
1 HQ ATC/XPTD TRAINING SYSTEMS DEVELOPMENT
1 USA INSTITUTE FOR MILITARY ASSISTANCE ATTN: ATSU-TD-TA
1 USAISD ATTN: ATSIE-DT
1 US ARMY ARMOR CENTER ATTN: ATZK-TD-PMO
1 USA AIR DEFENSE CENTER, FT. BLISS ATTN: ATZC-DIM
1 USA QUARTERMASTER SCHOOL DIRECTORATE OF TRAINING DEVELOPMENTS
1 US COAST GUARD ACADEMY /
1 USA TRANSPORTATION SCHOOL DIRECTORATE OF TRAINING + DOCTRINE
1 USA INFANTRY SCHOOL LIBRARY /
1 USA INFANTRY SCHOOL ATTN: ATSH-I-V
1 US ARMY INFANTRY SCHOOL ATTN: ATSH-CD
1 USA INFANTRY SCHOOL ATTN: ATSH-DOT-LRD
1 USA INFANTRY SCHOOL ATTN: ATSH-EV

Microfilmed From
Best Available Copy

1 USA MP + CHEM SCH/TNG CEN + FT. MCCLELLAN ATTN: ATZN-PTS
1 USA MP + CHEM SCH/TNG CEN + FT. MCCLELLAN DIR, COMBAT DEVELOPMENT
1 USA MP + CHEM SCH/TNG CEN + FT. MCCLELLAN DIR, TRAINING DEVELOPMENT
1 USA MP + CHEM SCH/TNG CEN + FT. MCCLELLAN ATTN: ATZN-MP-ACE
1 USA INSTITUTE OF ADMINISTRATION ATTN: RESIDENT TRAINING MANAGEMENT
1 USA SIGNAL CENTER + FT. GORDON CONRAD TECHNICAL LIBRARY
1 USA FIELD ARTILLERY SCHOOL MORRIS SWETT LIBRARY
1 USA INSTITUTE OF ADMINISTRATION ACADEMIC LIBRARY
1 USA WAR COLLEGE ATTN: LIBRARY
1 USA ENGINEER SCHOOL LIBRARY AND LEARNING RESOURCES CENTER
1 USA ARMOR SCHOOL (USARMS) ATTN: LIBRARY
1 US COAST GUARD ACADEMY LIBRARY
1 USA TRANSPORTATION SCHOOL TRANSPORTATION SCHOOL LIBRARY
1 ORGANIZATIONAL EFFECTIVENESS CEN + SCH ATTN: LIBRARIAN
1 US ARMY INTELLIGENCE CENTER + SCHOOL ATTN: ATSI-TD
1 US ARMY INTELLIGENCE CENTER + SCHOOL ATTN: ATSI-RM-M
1 US ARMY INTELLIGENCE CENTER + SCHOOL ATTN: ATSI-TD-LD
1 US ARMY INTELLIGENCE CENTER + SCHOOL ATTN: ATSI-CD-CS-C
1 US ARMY INTELLIGENCE CENTER + SCHOOL ATTN: ATSI-DT-SF-IM
1 US MARINE CORPS EDUCATION CENTER
1 USA FIELD ARTILLERY SCHOOL DIRECTORATE OF COURSE DEV + TRAINING
1 DEPARTMENT OF THE AIR FORCE AIR UNIVERSITY LIBRARY (ATC)
1 USA CHAPLAIN CENTER + SCHOOL ATTN: ATSC-TD-OD
1 USA CHAPLAIN CENTER + SCHOOL ATTN: ATSC-TD-ED
1 USA CHAPLAIN CENTER + SCHOOL ATTN: ATSC-TD-SF
1 USA CHAPLAIN CENTER + SCHOOL ATTN: ATSC-DOS-LLC
1 DEPARTMENT OF THE NAVY HUMAN RESOURCE MANAGEMENT SCHOOL
1 NAVAL POST GRADUATE SCHOOL
1 HQ TRADOC TRAINING DEVELOPMENT INSTITUTE
2 BRITISH EMBASSY BRITISH DEFENCE STAFF
2 CANADIAN JOINT STAFF
1 CDLS (W) LIBRARY
1 FRENCH ARMY ATTACHE
1 AUSTRIAN EMBASSY DEFENSE, MILITARY AND AIR ATTACHE
3 CANADIAN DEFENCE LIAISON STAFF ATTN: COUNSELLOR, DEFENCE R AND D
1 ROYAL NETHERLANDS EMBASSY MILITARY ATTACHE
1 CANADIAN FORCES BASE CORNWALLIS ATTN: PERSONNEL SELECTION
2 CANADIAN FORCES PERSONNEL APPL RSCH UNIT
1 ARMY PERSONNEL RESEARCH ESTABLISHMENT
1 NETHERLANDS EMBASSY OFFICE OF THE AIR ATTACHE
6 LIBRARY OF CONGRESS EXCHANGE AND GIFT DIV
1 DEFENSE TECHNICAL INFORMATION CEN ATTN: DTIC-DDA-2
140 LIBRARY OF CONGRESS UNIT DOCUMENTS EXPEDITING PROJECT
1 US GOVERNMENT PRINTING OFC LIBRARY, PUBLIC DOCUMENTS DEPARTMENT
1 US GOVERNMENT PRINTING OFC LIBRARY AND STATUTORY, LIB DIV (SLL)
1 THE ARMY LIBRARY ATTN: ARMY STUDIES SEC
3 ROYAL ARMY EDUCATIONAL CORPS CENTRE ARMY SCHOOL OF TRAINING SUPPORT
1 / /
1 / /
1 / /

NUMBER OF ADDRESSEES 297

TOTAL NUMBER OF COPIES 477